EXHIBIT 9

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Ex Parte* Reexamination of:	)	
	)	
U. S. Patent No. 8,553,079	)	Control No.: *To be assigned*
	)	
Issue Date: October 8, 2013	)	Group Art Unit: *To be assigned*
	)	
Inventor: Timothy R. Pryor	)	Examiner: *To be assigned*
	)	
Appl. No. 13/714,748	)	Confirmation No.: *To be assigned*
	)	
Filing Date: December 14, 2012	)	
	)	
For: MORE USEFUL MAN MACHINE INTERFACES AND APPLICATIONS	)	

Mail Stop *Ex Parte* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

REQUEST FOR *EX PARTE* REEXAMINATION OF U.S. PATENT NO. 8,553,079

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I. Introduction

An *ex parte* reexamination is requested on claims 1-30 ("the challenged claims") of U.S. Patent No. 8,553,079 that issued on October 8, 2013, to Pryor ("the '079 patent," Ex. PAT-A), for which the U.S. Patent and Trademark Office ("Office") files identify Gesture Technology Partners, LLC ("GTP") as the assignee. In accordance with 37 C.F.R. § 1.510(b)(6), Requester Samsung Electronics Co., Ltd. ("Requester") hereby certifies that the statutory estoppel provisions of 35 U.S.C. § 315(e)(1) and 35 U.S.C. § 325(e)(1) do not prohibit it from filing this *ex parte* reexamination request.

This request raises substantial new questions of patentability based on prior art that the Office did not have before it or did not fully consider during the prosecution of the '079 patent, and which discloses the features recited in the challenged claims.[1] The Office should find the claims unpatentable over this art.

On February 4, 2021, Patent Owner ("PO") initiated a litigation campaign asserting, *inter alia*, infringement of the '079 patent against five defendants across two different venues in *Gesture Technology Partners, LLC v. Huawei Device Co., Ltd.*, Case No. 2:21-cv-00040 (EDTX), *Gesture Technology Partners, LLC v. Samsung Electronics Co., Ltd.*, Case No. 2:21-cv-00041 (EDTX) (consolidated with Case No. 2:21-cv-0040 for all pretrial issues), *Gesture Technology Partners, LLC v. Apple Inc.*, Case No. 6:21-cv-00121 (WDTX), *Gesture Technology Partners, LLC v. Lenovo Group Ltd.*, Case No. 6:21-cv-00122 (WDTX), and *Gesture Technology Partners, LLC v. LG Electronics, Inc.*, Case No. 6:21-cv-00123 (WDTX). The *LG* case was transferred to *Gesture Technology Partners, LLC v. LG Electronics Inc.*, Case No. 2-21-cv-19234 (DNJ). Requester respectfully urges that this Request be granted and that reexamination be conducted with "special dispatch" pursuant to 35 U.S.C. § 305.

In accordance with 37 C.F.R. § 1.20(c)(1), the fee for *ex parte* reexamination (non-streamlined) is submitted herewith. If this fee is missing or defective, please charge the fee as well as any additional fees that may be required to Deposit Account No. 50-2613.

[1] At the time of filing of this Request, there are two pending *inter partes* reviews (IPR2021-00922 and IPR2022-00090) challenging the claims of the '079 patent based on prior art not presented in this Request.

II. Identification of Claims and Citation of Prior Art Presented

Requester respectfully requests reexamination of claims 1-30 of the '079 patent in view of the following prior art references, which are also listed on the attached PTO Form SB/08 (Ex. PA-SB08).

Exhibit PA-1	U.S. Patent No. 5,982,853 to Liebermann ("*Liebermann*")
Exhibit PA-2	U.S. Patent No. 6,385,331 to Harakawa *et al.* ("*Harakawa*")
Exhibit PA-3	U.S. Patent No. 6,198,485 to Mack *et al.* ("*Mack*")
Exhibit PA-4	Canadian Patent No. 2,175,288 to Bushnag ("*Bushnag*")
Exhibit PA-5	U.S. Patent No. 6,587,700 to Meins *et al.* ("*Meins*")
Exhibit PA-6	U.S. Patent No. 6,912,410 to Auten *et al.* ("*Auten*")

A copy of each of the above-listed references is attached to this request pursuant to 37 C.F.R. § 1.510(b)(3). A copy of the '079 patent is also attached to this request as Exhibit PAT-A pursuant to 37 C.F.R. § 1.510(b)(4).

III. Overview of the '079 Patent

A. Specification and Drawings of the '079 Patent

The '079 patent generally relates to "simple input devices" that use cameras to "determine gestures" performed in a "work volume" and illuminated by a light source. (Ex. PAT-A, 1:54, 2:54-3:8.) The devices are particularly "intended for use with 3-D graphically intensive activities" and operate "by optically sensing object or human positions and/or orientations." (*Id.*, 1:55-57.) This optical sensing is accomplished with "real time stereo photogrammetry using single or multiple TV cameras whose output is analyzed and used as input to a personal computer, typically to gather data concerning the 3D location of parts of, or objects held by, a person or persons." (*Id.*, 1:57-62.) In stereo photogrammetry, the devices use a processor to process "data obtained from

the cameras in order to look for the finger," which "can be done on both color basis and on the basis of shape as well as motion." (*Id.*, 4:65-5:3.) Alternatively, the optical sensing of gestures can be accomplished with an "electro-optical system capable of determining" the location of the relevant body parts in 3D space. (*Id.*, 12:38-42.)

The '079 patent "seeks to provide further detail on useful embodiments for computing," including a number of embodiments featuring "a keyboard for a laptop computer" and incorporating "digital TV cameras to look at points on, typically, the hand or the finger, or objects held in the hand of the user, which are used to input data to the computer." (*Id.*, 1:64-2:2, FIG. 1-3.) For example, FIG. 1 (reproduced below) "illustrates a laptop or other computer keyboard with cameras according to the invention located on the keyboard surface to observe objects such as fingers and hands overhead of the keyboard." (*Id.*, 2:15-18.) FIGS. 2 and 3 (reproduced below) further build on FIG. 1 by illustrating all features disclosed in FIG. 1 and introducing the use of additional finger detection features.

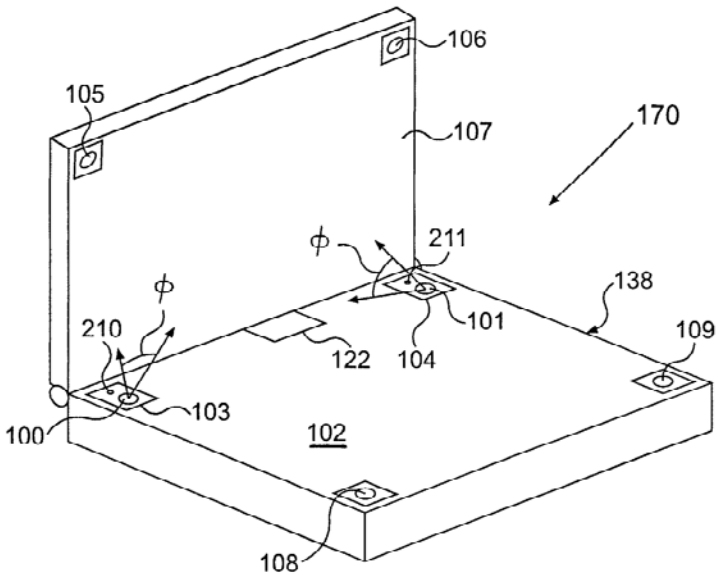


FIG. 1

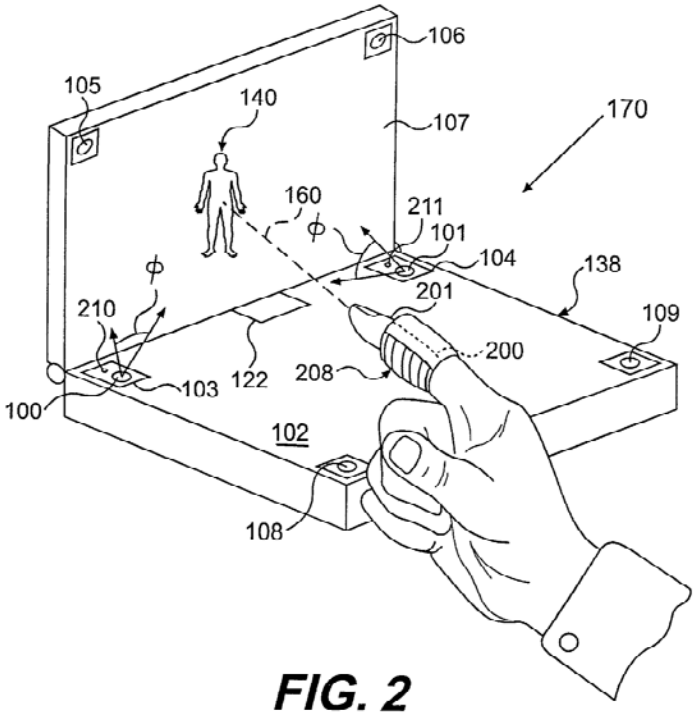


FIG. 2

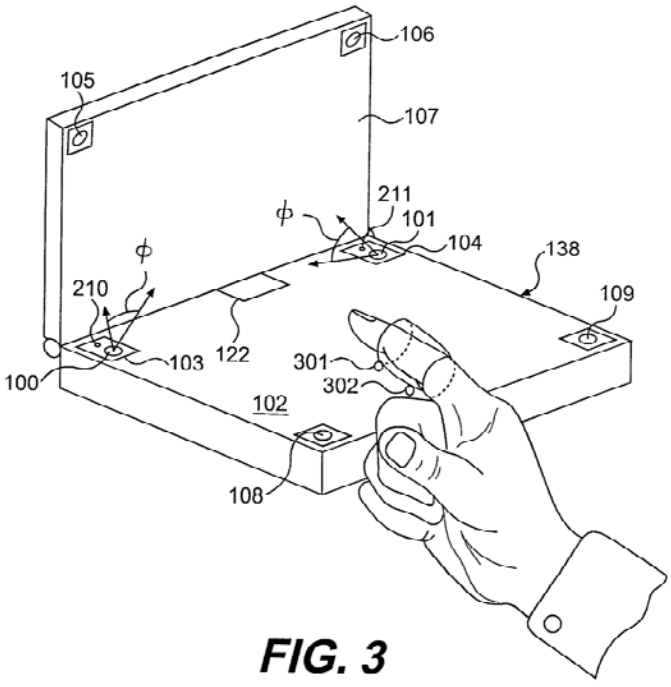


FIG. 3

(*Id.*, FIGS. 1-3.)

In the above embodiments, "a stereo pair of cameras 100 and 101 located on each side of the keyboard are used," with cameras "pointed obliquely inward at angles Φ toward the center of the desired work volume 170 above the keyboard." (*Id.*, 2:40-45.) Cameras 100 and 101 are "mounted at the rear of the keyboard (toward the display screen)," but may be placed in "[a]lternate camera locations . . . such as the positions of cameras 105 and 106, on upper corners of screen housing 107 looking down at the top of the fingers (or hands, or objects in hand or in front of the cameras), or of cameras 108 and 109 shown." (*Id.*, 2:40-53.) "Light from below, such as provided by single central light 122 can be used to illuminate the finger" that is "typically located . . . in work volume 170." (*Id.*, 3:1-6.) Using the cameras and the light source, as well as a "front end processor" that can be used "[t]o determine finger location," "[f]inger gestures comprising a sequence of finger movements" can be detected. (*Id.*, 3:43-51.) Additionally, "the pointing direction vector 160 of the user's finger" can also be detected using these features. (*Id.*, 2:55-56.)

"It is also desirable for fast reliable operation to use retroreflective materials and other materials to augment the contrast of objects used in the application." (*Id.*, 3:63-65.) FIG. 2 shows the use of "a line target such as 200 [which] can be worn on a finger 201," as well as a "retroreflective cylinder 208" which is also worn on the finger. (*Id.*, 3:65-66, 4:5-6.) "[A]ssuming each [stereo] camera is equipped with a sufficiently coaxial light source, typically one or more LEDs such as 210 and 211," such targets "effectively become[] a line image in the field of view of each camera," and "can be used to solve . . . for the pointing direction of the finger." (*Id.*, 4:4-14.) As shown in FIG. 3, "[i]t is also possible to have light sources on the finger" such as "the ring mounted LED light sources 301 and 302." (*Id.*, 4:16-22.) These light sources, which "can be used with either TV camera type sensors or with PSD type analog image position sensors as disclosed in references incorporated," can also aid in determination of "the pointing direction" by either being "modulated at different frequencies that can be individually discerned by sensors imaging the sources on to a respective PSD detector," or by being "turned on and off at different times such that the position of each point can be independently found allowing the pointing direction to be calculated from the LED point data gathered by the stereo pair of PSD based sensors." (*Id.*, 4:16-28.)

While the challenged claims broadly recite limitations relating to some of these high-level features, as demonstrated below, such features were already known and disclosed in the prior art before the alleged invention.

B. Claims of the '079 Patent

The '079 patent includes 30 claims, with claims 1, 11, and 21 as the only independent claims. (Ex. PAT-A, claims 1-30.) Independent claim 1 recites a computer-implemented method providing a light source and a camera, where the light source is "adapted to direct illumination through a work volume above the light source" and the camera is "oriented to observe a gesture performed in the work volume, the camera being fixed relative to the light source." (*Id.*, claim 1.) Additionally, independent claim 1 recites "determining, using the camera, the gesture performed in the work volume and illuminated by the light source." (*Id.*)

Independent claims 11 and 21 are very similar to claim 1, although slightly narrower in scope. (*Id.*, claims 1, 11, 21.) Claim 11 recites a computer apparatus, and like claim 1, it recites a light source and "a camera in fixed relation relative to the light source," with the camera "oriented to observe a gesture performed . . . in the work volume." (*Id.*, claims 1, 11.) However, the light source is "adapted to illuminate a human body part within a work volume generally above the light source" and the camera is "oriented to observe a gesture performed by the human body part in the work volume." (*Id.*, claim 11.) Claim 11 also recites "a processor adapted to determine the gesture performed in the work volume and illuminated by the light source based on the camera output." (*Id.*) Claim 21, like claim 1, recites a computer-implemented method where the light source is "adapted to direct illumination through the work volume" and a "light source in fixed relation relative to the camera." (*Id.*, claims 1, 21.) However, the camera is "oriented to observe a gesture performed in a work volume above the camera" and the camera is used to "detect[] . . . a gesture performed by at least one of a user's fingers and a user's hand in the work volume. (*Id.*, claim 21.)

The dependent claims, which are similar for the three independent claims, further specify: a light source of light emitting diodes; detecting a gesture by analyzing sequential camera images; various types of detected gestures; determining a pointing direction; positioning a target on a user; determining various three-dimensional point positions; a keypad; a three-dimensional display; various fixed relationships between components; and a laptop computer comprised of the elements. (*Id.*, claims 1-30.)

C. The '079 Patent Prosecution History

The application leading to the '079 patent—U.S. Application No. 13/714,748—was filed on December 14, 2012 as a continuation of application No. 12/700,055, filed on February 4, 2010,

which is a continuation of application No. 10/866,191, filed on June 14, 2004, which is a continuation of application No. 09/433,297, filed on November 3, 1999 (now U.S. Patent No. 6,750,848), which claims benefit of U.S. Provisional Application No. 60/107,652, filed November 9, 1998. (Ex. PAT-A, Cover.)

Before examination, original claims 1-20 were cancelled and claims 21-50 were added. (Ex. PAT-B, 133-138.) The Examiner allowed all of the claims 21-50, now claims 1-30, because "[t]he closest prior arts of record issued to Naoi et al. (US 5459793 A), Platzker et al. (US 5528263 A), Sellers (US 5864334 A) and Fukushima et al. (US 6346929 B1) fail to teach or suggest" the limitations of the independent claims. (*Id.*, 153.) The dependent claims were "considered allowable on the same basis as the independent claims." (*Id.*)

The references forming the substantial new questions of patentability—*Liebermann*, *Harakawa*, *Mack*, *Bushnag*, *Meins*, and *Auten*—were not cited or considered during prosecution of the '748 application. (Ex. PAT-A, Cover; Ex. PAT-B.) Likewise, these references are not cited and will not be considered in the pending IPRs. *Apple Inc. v. Gesture Technology Partners LLC*, IPR2021-00922 (filed May 18, 2021); *LG Electronics, Inc. et al. v. Gesture Technology Partners LLC*, IPR2022-00090 (filed November 5, 2021).

D. The Effective Priority Date of Claims 1-30 of the '079 Patent

For purposes of this reexamination only, Requester assumes that claims 1-30 are entitled to the filing date of Provisional application No. 60/107,652, identified on the cover of the '079 patent, which is November 9, 1998, listed on the cover of the '079 patent. (Ex. PAT-A, Cover.)

Liebermann issued on November 9, 1999, from Application No. 08/653,732 filed May 23, 1996; *Harakawa* issued on May 7, 2002, from Application No. 09/040,436 filed March 18, 1998; *Mack* issued on March 6, 2001, from Application No. 09/123,965 filed July 29, 1998; *Meins* issued on July 1, 2003, from Application No. 08/979,110 filed November 26, 1997; and *Auten* issued on June 28, 2005, from Application No. 09/138,920 filed August 24, 1998. Thus, *Liebermann*, *Harakawa*, *Mack*, *Meins*, and *Auten* qualify as prior art at least under pre-AIA 35 U.S.C. § 102(e).

Bushnag is a publication of a patent application laid "Open to Public Insp[ection]" (i.e., publically accessible as a printed publication) by the Canadian Intellectual Property Office on October 30, 1997. *See eBay v. MoneyCat*, CBM2014-00092, Paper 12 at 12 (P.T.A.B. Sep. 24, 2014) (crediting "Open to Public Insp." date as establishing Canadian laid-open patent application

as publicly accessible printed publication) (citing *In re Wyer*, 655 F.2d 221 (C.C.P.A. 1981)); *In re Wyer*, 655 F.2d 221 (C.C.P.A. 1981); *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374 (Fed. Cir. 2006) (determining a Canadian patent application was publically accessible and thus a printed publication); *see also* Ex. PA-4, 1 (listing an October 30, 1997 date); Ex. PA-7 (listing the open to public inspection date of the *Bushnag* reference as October 30, 1997). Thus, *Bushnag* qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(b).

IV. Claim Construction

In a reexamination proceeding involving claims of an expired patent, claim construction pursuant to the principle set forth by the court in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316, 75 USPQ2d 1321, 1329 (Fed. Cir. 2005) (words of a claim "are generally given their ordinary and customary meaning" as understood by a person of ordinary skill in the art in question at the time of the invention) should be applied since the expired claim[s] are not subject to amendment. MPEP § 2258 I.(G) (citing *Ex parte Papst-Motoren*, 1 USPQ2d 1655 (Bd. Pat. App. & Inter. 1986)). The '079 patent, which lists November, 3, 1999, as the date of the earliest related continuation and does not list any term extensions or adjustments, has expired. (*See* Ex. PAT-A, Cover.) Therefore, the claim interpretations submitted or implied herein for the purpose of this reexamination adhere to the *Phillips* standard. *See In re CSB-System Int'l, Inc.*, 832 F.3d 1335, 1340-42 (Fed. Cir. 2016).[2]

The district court in the related Eastern District of Texas cases recently construed/considered ten terms recited in the claims of the '079 patent under the *Phillips* standard. (Ex. CC-3.) A summary of the district court constructions/interpretations and the constructions advanced by the parties in the litigation is listed in the below table.

[2] Requester reserves all rights to raise claim constructions and other arguments in other venues. For example, Requester has not necessarily raised all challenges to the '079 patent in this proceeding, including those under 35 U.S.C. § 112, given the limitations placed by the Rules governing this proceeding. For example, Requester has alleged some terms are indefinite in district court proceedings. But given how closely the prior art maps to the claims (as explained below), those issues do not need to be resolved to assess patentability in this proceeding. In addition, a comparison of the claims to any accused products in litigation may raise controversies that need to be resolved through claim construction that are not presented here given the similarities between the references and the '079 patent. Thus, the SNQs presented herein should not be interpreted to (and do not) conflict with Requester's indefiniteness positions in other proceedings regarding the '079 patent (and how the Court ruled on such positions) (Ex. CC-3.).

'079 Patent Terms	E.D. Texas Construction	Construction Advanced by Defendant(s)	Construction Advanced by PO
"light source adapted to direct illumination through a work volume above the light source" of claims 1-3, 9-10	plain meaning (Ex. CC-3, 61-63)	"a light source designed to transmit light directly through a work volume above the component" (Ex. CC-3, 61-63)	no construction necessary (Ex. CC-3, 61-63)
"light source adapted to illuminate a human body part within a work volume generally above the light source" of claims 11, 14-15	plain meaning (Ex. CC-3, 61-63)	"a light source designed to transmit light directly onto a human body part within a work volume generally above the component" (Ex. CC-3, 61-63)	no construction necessary (Ex. CC-3, 61-63)
"light source in fixed relation relative to the camera and adapted to direct illumination through the work volume" of claims 21-23, 30	plain meaning (Ex. CC-3, 61-63)	"a light source in fixed relation relative to the camera and designed to transmit light directly through the work volume" (Ex. CC-3, 61-63)	no construction necessary (Ex. CC-3, 61-63)
"gesture" of claims 1, 4-5, 11, 18-21, 24-25	"movement of hands or other body parts that conveys meaning" (Ex. CC-3, 54-57)	"a sequence of positions that conveys a meaning" (Ex. CC-3, 54-57)	no construction necessary (Ex. CC-3, 54-57)
"work volume above the light source" of claims 1, 6-7	"space that is above the light source and wherein gestures can be performed and detected" (Ex. CC-3, 68-71)	"volume of space above the light source visible to the camera within which gestures are performed" (Ex. CC-3, 68-71)	no construction necessary (Ex. CC-3, 68-71)
"work volume generally above the light source" of claims 11-12	"space that is generally above the light source and wherein gestures can be performed and detected" (Ex. CC-3, 68-71)	"volume of space generally above the light source visible to the camera within which gestures are performed" (Ex. CC-3, 68-71)	no construction necessary (Ex. CC-3, 68-71)
"work volume above the camera" of claim 21	"space that is above the camera and wherein gestures can	"volume of space above the camera visible to the camera	no construction necessary (Ex. CC-3, 68-71)

'079 Patent Terms	E.D. Texas Construction	Construction Advanced by Defendant(s)	Construction Advanced by PO
	be performed and detected" (Ex. CC-3, 68-71)	within which gestures are performed" (Ex. CC-3, 68-71)	
"a processor adapted to determine the gesture performed in the work volume and illuminated by the light source based on the camera output" of claim 11	plain meaning (Ex. CC-3, 64-66)	terms invoke 35 U.S.C. § 112, ¶ 6: function = "determine the gesture performed in the work volume and illuminated by the light source based on the camera output"; structure = indefinite[3] (Ex. CC-3, 64-66)	no construction necessary and the terms do not invoke 35 U.S.C. § 112, ¶ 6 (Ex. CC-3, 64-66)
"three-dimensional position" of claims 8, 28	plain meaning (Ex. CC-3, 66-67)	"a position defined with respect to three perpendicular axes (xyz)" (Ex. CC-3, 66-67)	no construction necessary (Ex. CC-3, 66-67)
"adapted to" of claims 1, 11, 21	plain meaning (Ex. CC-3, 57-60)	light source: "designed to"; processor: "programmed to" (Ex. CC-3, 57-60)	no construction necessary (Ex. CC-3, 57-60)

The prior art mappings found in Section V of this Request explain how the claims of the '079 patent are invalid under the constructions of the district court as well as the constructions advanced by both PO and Defendants. Indeed, the claims would be unpatentable under any reasonable construction of the terms given how closely the prior art maps to the claims. More generally, Section V demonstrates how the prior art meets the limitations of the challenged claims under their plain meaning (as adopted by the district court) unless otherwise noted. Specific

[3] While the district court declined to find this term indefinite, Requester does not concede the claim is definite by demonstrating how the prior art discloses/suggests this limitation below. Instead, as noted, Requester presents how a substantial new question of patentability is raised by the prior art where the term is interpreted under the district court's (and PO's) plain meaning interpretation of the claimed term, and also as construed below.

information regarding disputed terms in the Eastern District of Texas litigation concerning the '079 patent follows.

A. "light source adapted to direct illumination through a work volume above the light source" of claims 1-3, 9-10

The Defendants have contended that the above limitation should be construed to mean "a light source designed to transmit light directly through a work volume above the component." (Ex. PAT-A, FIGS. 1-3, 2:49-58, 3:1-3. 4:4-24, 4:61-64; *see also id.*, claims 1-3, 9-10.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 13-14; Ex. CC-2, 20.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 61-63.)

B. "light source adapted to illuminate a human body part within a work volume generally above the light source" of claims 11, 14-15

The Defendants have contended that the above limitation should be construed to mean "a light source designed to transmit light directly onto a human body part within a work volume generally above the component." (Ex. PAT-A, FIGS. 1-3, 2:49-58, 3:1-3. 4:4-24, 4:61-64; *see also id.*, claims 11, 14-15.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 13-14; Ex. CC-2, 20.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 61-63.)

C. "light source in fixed relation relative to the camera and adapted to direct illumination through the work volume" of claims 21-23, 30

The Defendants have contended that the above limitation should be construed to mean "a light source in fixed relation relative to the camera and designed to transmit light directly through

the work volume." (Ex. PAT-A, FIGS. 1-3, 2:49-58, 3:1-3. 4:4-24, 4:61-64; *see also id.*, claims 21-23, 30.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 13-14; Ex. CC-2, 20.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 61-63.)

D. "gesture" of claims 1, 4-5, 11, 18-21, 24-25

The Defendants have contended that the claimed "gesture" should be construed to mean "a sequence of positions that conveys a meaning." (Ex. PAT-A, 2:54-64, 3:48-51, 5:23-39, 5:63-65, 9:49-62; *see also id.*, claims 5, 18-20, 25.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 13; Ex. CC-2, 19.) The district court construed "gesture" to mean "movement of hands or other body parts that conveys meaning." (Ex. CC-3, 54-57.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under both PO's interpretation (i.e., plain meaning) and the district court's construction order.

E. "work volume above the light source" of claims 1, 6-7

The Defendants have contended that the above limitation should be construed to mean "volume of space above the light source visible to the camera within which gestures are performed." (Ex. PAT-A, FIGS. 1-2, 2:39-48, 3:4-20, 3:56-61, 4:29-40, 5:14-21.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 16; Ex. CC-2, 22-23.) The district court construed the above limitation to mean "space that is above the light source and wherein gestures can be performed and detected." (Ex. CC-3, 68-71.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under both PO's interpretation (i.e., plain meaning) and the district court's construction order.

F. "work volume generally above the light source" of claims 11-12

The Defendants have contended that the above limitation should be construed to mean "volume of space generally above the light source visible to the camera within which gestures are performed." (Ex. PAT-A, FIGS. 1-2, 2:39-48, 3:4-20, 3:56-61, 4:29-40, 5:14-21.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 16; Ex. CC-2, 22-23.) The district court construed the above limitation to mean "space that is generally above the light source and wherein gestures can be performed and detected." (Ex. CC-3, 68-71.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under both PO's interpretation (i.e., plain meaning) and the district court's construction order.

G. "work volume above the camera" of claim 21

The Defendants have contended that the above limitation should be construed to mean "volume of space above the camera visible to the camera within which gestures are performed." (Ex. PAT-A, FIGS. 1-2, 2:39-48, 3:4-20, 3:56-61, 4:29-40, 5:14-21.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 16; Ex. CC-2, 22-23.) The district court construed the above limitation to mean "space that is above the camera and wherein gestures can be performed and detected." (Ex. CC-3, 68-71.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under both PO's interpretation (i.e., plain meaning) and the district court's construction order.

H. "a processor adapted to determine the gesture performed in the work volume and illuminated by the light source based on the camera output" of claim 11

PO argued in district court that this "processor" does not require construction and does not invoke § 112, ¶ 6. (Ex. CC-1, 20; Ex. CC-2, 26-28, 69.) Requester demonstrates below in Section V how the prior art addresses this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 64-66.)

To the extent this limitation is found to be subject to 35 U.S.C. § 112, ¶ 6, Requester proposes the following construction (under the assumption the Office determines appropriate structure is provided in the '079 patent, which Requester does not concede).

Construing a means-plus-function claim term requires that the function recited in the claim term be first identified; then, the written description of the specification must be consulted to identify the corresponding structure that performs the identified function and equivalents thereof. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1351 (Fed. Cir. 2015); *see also Gracenote, Inc. v. Iceberg Indus., LLC*, IPR2013-00551, Paper No. 6 at 15 (Feb. 28, 2014).

The identified function is to "determine the gesture performed in the work volume and illuminated by the light source based on the camera output." (Ex. PAT-A, 2:58-61, 3:48-51, claim 11.) The dependent claims from claim 11 further add to the function, including determining a pointing gesture (claim 19). (*Id.*, claims 18-20.)

A structure disclosed in the specification qualifies as corresponding structure only if it is clearly linked by the patent's specification (or possibly the prosecution history) to performing the claimed function. *See Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005). Where a means-plus-function term is directed to software, the specification must "disclose an algorithm for performing the claimed function." *Williamson*, 792 F.3d at 1352. For purposes of this proceeding only, Requester interprets the corresponding structure of the above-identified function as software running on a processor configured to performed the identified function or equivalents thereof given the lack of relevant disclosure in the '079 patent specification. (*See also supra* footnote 2.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

I. "three-dimensional position" of claims 8, 28

The Defendants have contended that the claimed "three-dimensional position" should be construed to mean "a position defined with respect to three perpendicular axes (xyz)." (Ex. PAT-A, 8:63-67, claims 8, 28.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 15-16; Ex. CC-2, 22.) Requester likewise demonstrates below in Section V how the prior art addresses

this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 66-67.)

J. "adapted to" of claims 1, 11, 21

The Defendants have contended that the claimed light source that is "adapted to" operate as claimed should be construed to mean a light source that is "designed to" operate as claimed; and the claimed processor that is "adapted to" operate as claimed should be construed to mean a processor that is "programmed to" operate as claimed. (Ex. PAT-A, FIGS. 1-3, 2:49-61, 3:1-3, 3:48-51, 4:4-24, 4:61-64; *see also id.*, claims 1-3, 9-12, 14-15, 18-23, 30.) Requester demonstrates below in Section V how the prior art addresses this limitation under this interpretation.

PO has contended that the above limitation does not require construction. (Ex. CC-1, 15; Ex. CC-2, 19-20.) Requester likewise demonstrates below in Section V how the prior art addresses this limitation under PO's interpretation, which also reflects the plain meaning mapping warranted by the district court's construction order. (Ex. CC-3, 57-60.)

V. Statement of Substantial New Questions of Patentability

As mentioned above, *Liebermann*, *Harakawa*, *Mack*, *Bushnag*, *Meins*, and *Auten* were never made of record or considered by the Office during original prosecution. But the references (in various combinations for respective claims, as discussed below) disclose or suggest all of the features of claims 1-30.

SNQ1: *Liebermann* raises a substantial new question of patentability (SNQ1) with respect to claims 1, 4-9, 11-12, 17-21, 24-28, and 30 of the '079 patent.

SNQ2: *Liebermann* in view of *Harakawa* raises a substantial new question of patentability (SNQ2) with respect to claims 6 and 26 of the '079 patent.

SNQ3: *Liebermann* in view of *Mack* raises a substantial new question of patentability (SNQ3) with respect to claims 7, 16, 17, 27, and 29 of the '079 patent.

SNQ4: *Liebermann* in view of *Bushnag* raises a substantial new question of patentability (SNQ4) with respect to claim 10 of the '079 patent.

SNQ5: *Liebermann* in view of *Meins* raises a substantial new question of patentability (SNQ5) with respect to claim 13 of the '079 patent.

SNQ6: *Liebermann* in view of *Auten* raises a substantial new question of patentability (SNQ6) with respect to claims 2, 3, 14, 15, 22, and 23 of the '079 patent.

Thus, for these reasons and the reasons discussed below and in the accompanying declaration of Dr. Gregory D. Abowd (Ex. PA-DEC), the above grounds raise substantial new questions of patentability with respect to the '079 patent. (*See also* Ex. PA-DEC, ¶¶ 1-36.) Proposed rejection 1, discussed below in Section VI.B.1, corresponds to SNQ1; proposed rejection 2, discussed below in Section VI.B.2, corresponds to SNQ2; proposed rejection 3, discussed below in Section VI.B.3, corresponds to SNQ3; proposed rejection 4, discussed below in Section VI.B.4, corresponds to SNQ4; proposed rejection 5, discussed below in Section VI.B.5, corresponds to SNQ5; and proposed rejection 6, discussed below in Section VI.B.6, corresponds to SNQ6.

A. SNQ1: *Liebermann*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* discloses or suggests the limitations of claims 1, 4-9, 11-12, 17-21, 24-28, and 30 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-54, 71-153.)

1. Overview of *Liebermann*

Liebermann discloses "a novel electronic communication system" and "a unique method utilizing such an electronic communication system to enable communication by and to deaf persons." (Ex. PA-1, 3:11-24.) FIG. 6 discloses a cellular telephone that serves as a "portable transmitter/receiver generally designated by the numeral 8 for use by a deaf person," which "contains a video camera, the lens 10 of which is disposed in the upright portion 12. In the base portion 13 are an LCD display panel 14 and a key pad 16 for dialing and other functions." (*Id.*, FIG. 6, 4:21-22, 5:62-67.) The cellular phone also has an antenna 18 to allow wireless communication "through a cellular telephone network." (*Id.*, 5:67-6:2.) The visual display of the cellular phone may "present multiple [types of] information to the deaf person such as touchless function buttons, system status indicators, alarms, a printed translation, and a playback of the image being recorded, as well as the signing images and text of the hearing person's responses." (*Id.*, 6:31-36.) FIG. 6 of *Liebermann* is reproduced below.

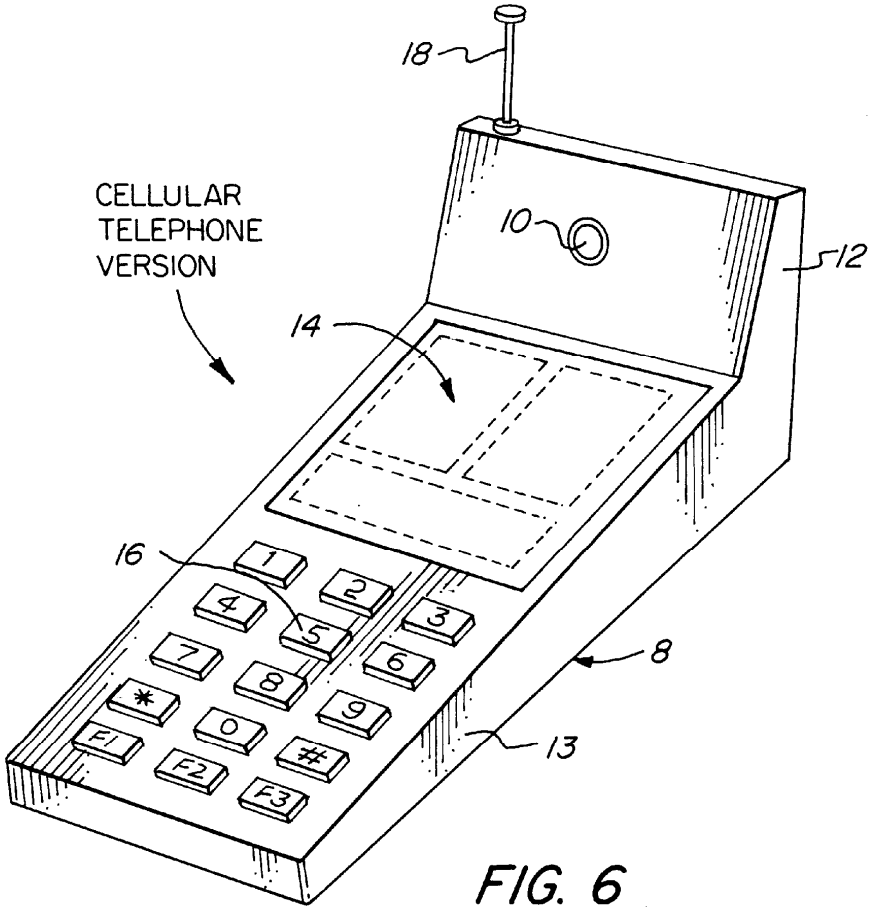


FIG. 6

(*Id.*, FIG. 6.)

In order to communicate through the device, "[t]he device is supported in a stable position and the deaf person is positioned so that the camera lens 10 will record the signing movement of the hands and fingers and body and facial motions and expressions." (*Id.*, 6:2-6.) "The signing motions captured by the camera are converted into digital data for processing by the translation software." (*Id.*, 6:6-8.) "In the initial processing, each of the frames containing a captured image undergoes a process whereby the image is collapsed into a small set of fixed identifiers." (*Id.*, 6:47-49.) The resulting information is then sent via a phone line to a central data processing, where "[t]he rest of the processing is completed." (*Id.*, 6:50-53.) "This includes identification of the letters, numbers and words, conversion to standard sign language, and the conversion to spoken language which results in the equivalent text of the signed content." (*Id.*, 6:53-57.) The text is then converted to synthesized speech and sent to the hearing person on the other end of the phone line. (*Id.*, 6:53-63.) A hearing person's responsive speech is sent to the central processing center,

where it is "transformed into the equivalent signing content and then into textual material." (*Id.*, 7:10-12.) The resulting data is then sent back to the signing user's device, where "[s]oftware in the device converts the text into reduced identifying pointers for each gesture, which are then converted into animated images which portray in sign language the content of the speech processed in the center." (*Id.*, 7:12-17.) "The result is an animated content on the LCD of the [signing person's device] which portrays in sign language the spoken content of the normally hearing person." (*Id.*, 7:41-43.)

Liebermann additionally discloses detailed algorithms for translating sign language to spoken content, and converting speech back to sign language. (*Id.*, 7:44-9:27 (disclosing an algorithm for figure tracking for use in the sign language to speech translation), 9:28-10:53 (disclosing an algorithm for increasing accuracy of speech recognition and conversion to digital data).) *Liebermann* provides helpful schematics as well that illustrate the methods for "converting signing into speech" (FIG. 9) and converting "text to signing animation" (FIG. 11), as well as more specific illustrations of "translation of American Sign Language to English text" (FIG. 16) and "translation of English text to American Sign Language (ASL)" (FIG. 15). (*Id.*, FIGS. 9, 11, 15, 16.) FIG. 9, which illustrates conversion of signing to speech and thus handles most of the gesture recognition in *Liebermann*, is reproduced below.

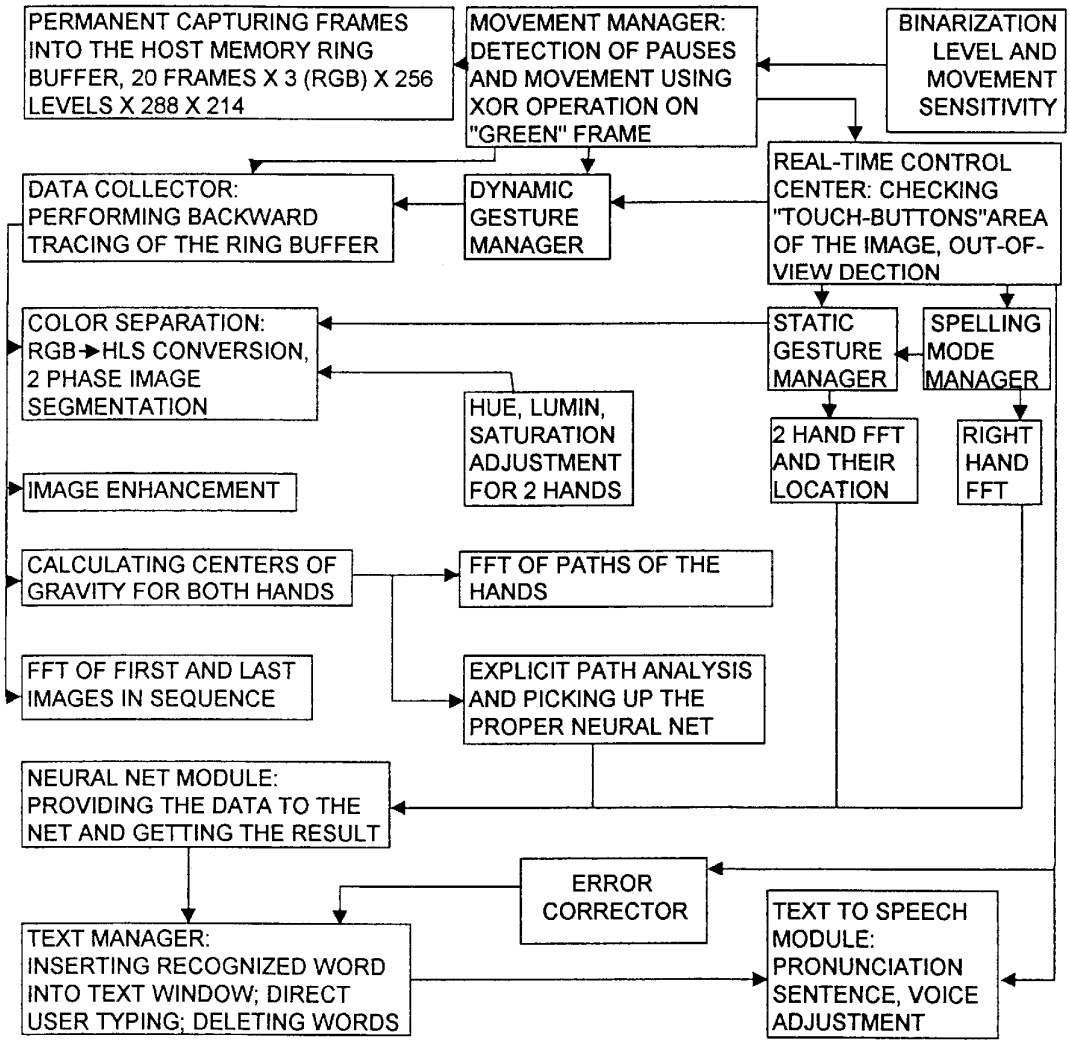


FIG. 9

(*Id.*, FIG. 9.)

Because *Liebermann* relates to personal computing devices that perform optical sensing of human inputs, *Liebermann* is in the same or similar technical field as the '079 patent, and a POSITA would have had reason to consider the teachings of *Liebermann*. (*Supra* Section III.A; Ex. PA-DEC, ¶¶51-54.) To the extent *Liebermann* is not within the field of endeavor of the '079 patent, *Liebermann* is reasonably pertinent to problems associated with optically sensing and detecting human inputs/gestures using personal computing devices, problems with which the inventor was involved. (*Supra* Section III.A; Ex. PA-DEC, ¶¶51-54.)

2. Claim 1

As explained below, *Liebermann* discloses or suggests the limitations recited in claim 1. (Ex. PA-DEC, ¶¶ 72-96.)

a. [1.a] A computer implemented method comprising:

Liebermann discloses or suggests this preamble to the extent limiting. (Ex. PA-DEC, ¶¶ 72-89.) *Liebermann* discloses a "portable transmitter/receiver," as shown in FIG. 6, that is in the "form of a cellular telephone," which a person of ordinary skill in the art (POSITA) would have understood contains a computer within the cellular phone frame. (Ex. PA-1, 4:21-22, 5:62-63; Ex. PA-DEC, ¶ 73.) In particular, *Liebermann* discloses that the cellular telephone includes hardware that works with the camera to view and obtain images of hand gestures, performs related "initial processing," and populates a phone display, among other things. (Ex. PA-1, 5:62-6:10, 6:40-52, FIG. 8; Ex. PA-DEC, ¶ 73.) Thus, a POSITA would have understood that the cellular telephone necessarily includes a computer or similar component for performing various disclosed computer implemented functions, including, but not limited to, controlling cameras, driving a display, transmitting information, receiving information, processing data, etc. (Ex. PA-1, 5:62-6:47, FIGS. 1, 8.) *See* MPEP § 2114 ("[T]he term 'computer' is commonly understood by one of ordinary skill in the art to describe a variety of devices with varying degrees of complexity and capabilities. *In re Paulsen*, 30 F.3d 1475, 1479-80, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994). The *Liebermann* cellular phone also has a video camera, an LCD display, a key pad, and "an antenna 18 for the device so that it may be transported and communicate as a wireless remote or through a cellular telephone network." (Ex. PA-1, 5:62-6:2; Ex. PA-DEC, ¶ 74.) Through this wireless connection, the cellular phone works in conjunction with "a dedicated central computer facility" to "provide a novel electronic communication system for use by deaf persons to enable them to communicate by signing" as well as "a unique method utilizing such an electronic communication system to enable communication by and to deaf persons." (Ex. PA-1, 3:11-13, 3:22-24, 5:62-6:14; Ex. PA-DEC, ¶ 74.)

Liebermann describes how these computers work together to effect communication via a computer-implemented method. (Ex. PA-DEC, ¶ 75.) The deaf user "uses sign language in front of the transmitter/receiver device containing the camera" (i.e., the cellular phone) and the camera

"record[s] the signing movement of the hands and fingers and body and facial motions and expressions" of the user. (Ex. PA-1, 6:2-6, 6:42-43.) "The camera in the cellular phone transmits the image for initial processing in the cellular phone." (*Id.*, 7:19-21.) The cellular phone's internal computer performs the initial processing, during which "each of the frames containing a captured image undergoes a process whereby the image is collapsed into a small set of fixed identifiers." (*Id.*, 6:47-49.) The cellular phone—which "maintains two cellular connections on line, one to the [central processing] center (voice/data) and one to the [hearing] caller"—then sends the "reduced data . . . to the center for processing." (*Id.*, 7:21-26.) "The rest of the processing is completed at the center," including "identification of the letters, numbers and words, conversion to standard sign language, and the conversion to spoken language which results in the equivalent text of the signed content. The text then undergoes a text to synthesized speech transformation and the speech is sent as an analog content to the normally hearing person." (*Id.*, 6:53-59.) These same computers in the hearing user's device, the central processing center, and the deaf user's cellular phone work together to enable communication in the reverse direction as well. (*Id.*, 5:14-19; Ex. PA-DEC, ¶ 76.) The hearing person's speech is sent to the processing center for conversion to text (or reduced identifiers, depending on the transmission line and relative computer capabilities), and the text (or set of reduced identifiers) is sent to the deaf user's cellular phone for conversion into signing animation, which appears on the phone display. (Ex. PA-1, 5:14-19.) Thus, a POSITA would have understood that the deaf user's FIG. 6 cellular phone (and its internal computer) and the central computer processing facility together perform "[a] computer implemented method" for sign detection to allow deaf users to communicate with hearing users through an electronic communication system. (Ex. PA-DEC, ¶ 77.)

To the extent the claimed "computer implemented method" is read to require a method implemented by a single computer and that *Liebermann* is read to not disclose a "computer" implemented method performed by the cellular phone, a POSITA would have found it obvious to configure *Liebermann*'s cellular phone to include a computer that performs the operations and processing steps disclosed by *Liebermann*, including the initial processing and the gesture recognition processing described herein, locally within a cellular telephone computer in order to provide an integrated phone and to conserve bandwidth. (*Id.*, ¶ 78.) *See In re Yufa*, 452 F. App'x. 998, 1001 (Fed. Cir. 2012) (citing *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)) (affirming obviousness because the prior art disclosed "every element of the claims except" the

location for "the processing of" data, which was "nothing more than a reconfiguration of a known system"). Indeed, *Liebermann* contemplates adjustments to where processing may occur based on the processing power of the user's device and the bandwidth of the transmission line. (Ex. PA-1, 5:25-30 (disclosing modifications to portions of the speech-to-sign processing based on the strength of "the transmission line and computer capability of the deaf person's location"); Ex. PA-DEC, ¶ 79.) *Liebermann* also discloses that the choice to perform the initial processing (conversion of signs to an intermediate set of fixed identifiers) in the cellular phone and the remaining processing (conversion of identifiers to text, and text to speech) in the central processing facility is a design choice driven by economics. (Ex. PA-1, 6:10-12.) Furthermore, *Liebermann* discloses that the disclosed device can function as "an ***on-site*** translator" rather than just a telephone for the deaf. (*Id.*, 13:37-39.) Thus, a POSITA would have been motivated to implement such a modification based on the guidance and suggestions in *Liebermann*, and based on the state of the art knowledge that designs for such computer-based systems were known to be adjusted to have distributed or locally performed operations depending on the application, capabilities, and design of the device(s), etc. (Ex. PA-DEC, ¶ 80.) A POSITA would have therefore had reasons to consider and configure the *Liebermann* method such that the disclosed processing takes place in the cellular phone. (*Id.*)

A POSITA would have considered the tradeoffs in designs when contemplating such a modification, including the types of hardware, software programming/coding, and the like to ensure the resulting modified cellular phone was efficiently designed and operated in accordance with *Liebermann*'s functionalities and features as disclosed. (Ex. PA-DEC, ¶ 81.) Such tradeoffs (e.g., additional components and/or costs in design, power considerations, etc.), even if present, would not have deterred such a modification from being implemented, especially considering the benefits that would have been obtained by the implementation (e.g., versatility in obtaining local processing versus distributed operations, etc.) and the skills of a POSITA to design such a modified device for efficient operation. *See, e.g.*, *In re Farrenkopf*, 713 F.2d 714, 718 (Fed. Cir. 1983) (finding additional expense associated with a particular combination would not discourage one of ordinary skill in the art from seeking the benefit expected therefrom). Indeed, a POSITA would have been motivated to make such a modification because an integrated cellular phone device that performs processing of signs to text and speech locally, on the cellular phone's computer, would have desirably conserved bandwidth, and beneficially enabled the cellular phone device to perform

its functions independently, where, for example, communication with the central processing facility is interrupted or otherwise unavailable. (Ex. PA-DEC, ¶ 82.) A POSITA would have also been motivated to make the proposed modification as it would have provided additional features and applications to the cellular phone device. (*Id.*) Furthermore, as a POSITA would have understood, the proposed modification would have reduced network communication demands because the modified cellular telephone would communicate with the hearing user's device directly instead of through an intermediate network computer. (*Id.*) Such a modification would have improved device performance because it would not require communication with a remote processing center, which requires additional telecommunication bandwidth. (*Id.*) Thus, a POSITA would have understood from *Liebermann*'s disclosures that the cellular phone device could be advantageously modified so that the "identification of the letters, numbers and words" is fully performed by the cellular phone's computer (that is, the entire gesture recognition method would be performed by the cellular phone's computer, rather than splitting the computer implemented method across the local and network computers). (Ex. PA-1, 6:42-52; Ex. PA-DEC, ¶ 83.)

A POSITA would have had a reasonable expectation of success in implementing this modification because it would have involved modifying the *Liebermann* communication system in a manner that *Liebermann* suggests is feasible—adapting which portions of the processing occur in the cellular phone. (Ex. PA-DEC, ¶ 84.) A POSITA would have also had the skill to implement, and expectation of success in achieving such a modification, because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann*)) according to known methods (e.g., adapting the processing so that some of the processing responsibilities of a processing center are instead given to the local device (*Liebermann*)) to yield the predictable result of a cellular phone that performs the entire computer implemented method of *Liebermann*. (*Id.*) *See KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

b. [1.b] providing a light source adapted to direct illumination through a work volume above the light source;

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 85-89.) While *Liebermann* does not expressly disclose that the cellular phone provides a light source adapted to direct illumination through a work volume above the light source, a POSITA would have found it

obvious to implement such a feature in view of *Liebermann*'s disclosures and the knowledge of the state of the art. (*Id.*, ¶ 86.)

A POSITA would have understood from *Liebermann*'s disclosures that adequate lighting of the deaf user's gestures is critical. (*Id.*, ¶ 87.) In a public telephone kiosk embodiment—which operates in substantially the same way as the cellular phone—the kiosk features "lamps 48 to ensure adequate lighting of the user's hands, face and body." (Ex. PA-1, 5:57-59, FIG. 5C (reproduced below).)

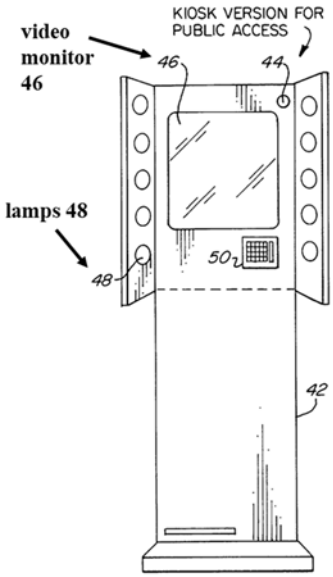


FIG. 5C

(*Id.*, FIG. 5C (annotated to show lamps 48 on sides of display 46).) A POSITA would have understood that in this kiosk, the lamps are collectively a light source and are adapted to, or *designed for* (*see* Section IV.J), direct illumination through the work volume of the kiosk. (Ex. PA-DEC, ¶ 87.) *Liebermann* discloses that the lamps of the public telephone kiosk are used "to ensure adequate lighting of the user's hands, face and body"— the parts of the deaf user's body that are used to sign. (Ex. PA-1, 5:57-59.) Accordingly, a POSITA would have recognized that these lamps are designed to directly illuminate, or transmit light directly onto (*see* Section IV.A), *the deaf user's gestures* in the work volume. (*Id.*, ¶ 87.) As discussed in Sections IV.E-G, under Requester's proposed construction, the "work volume" of the '079 patent is the "volume of space . . . visible to the camera within which gestures are performed," or under the district court's construction order, the "space . . . wherein gestures can be performed and detected." (Sections IV.E-G.) Under either construction, the user's hands, face, and body that perform gestures are

within the work volume. (Ex. PA-DEC, ¶ 87.) Thus, a POSITA would have understood that because the kiosk lights are adapted to (or designed for) direct illumination of the user's hands, face, and body, which are *within* the work volume, the lamps directly illuminate (or transmit light directly) *through* the work volume. (*Id.*)

A POSITA would have been motivated to install a similar light source in the cellular phone device adapted to direct illumination of the work volume. (*Id.*, ¶ 88.) A POSITA would have recognized that the cellular phone detects gestures in much the same way as the kiosk and has similar lighting needs in order to adequately illuminate the gestures. (*Id.*) Furthermore, a POSITA would have understood that a cellular phone would desirably be functional in low ambient light settings, and that the cellular phone does not disclose a light source in the cellular phone that would allow for full functionality in low ambient light situations. (*Id.*) Thus, a POSITA would have understood the benefits of modifying the *Liebermann* cellular phone in order to incorporate a light source for directly illuminating the user's gestures performed within the work volume. (*Id.*) A POSITA would have also understood that in order to directly illuminate the work volume of a cellular phone in a similar way as described above for the work volume of a kiosk, the light source modification would comprise a series of lights on each side of the display. (*Id.*; *see also* Ex. PA-1, FIG. 5C (reproduced above and showing a series of lights on each side of the display), FIG. 6 (reproduced below).)

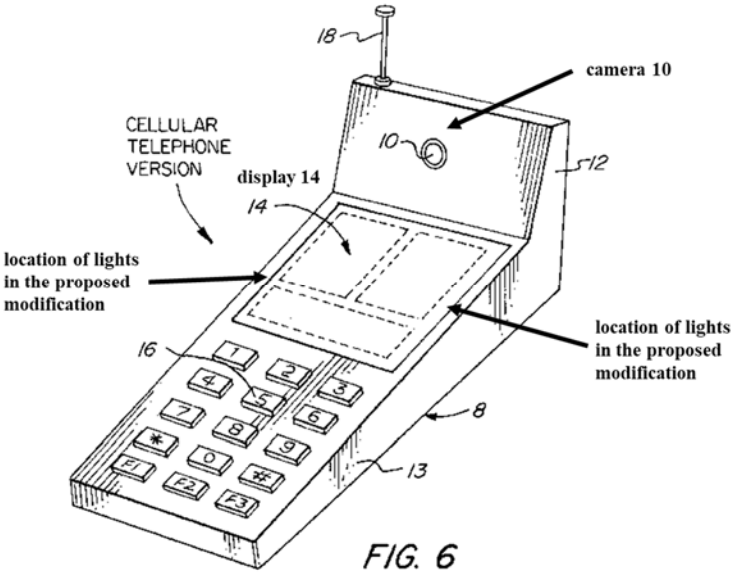


FIG. 6

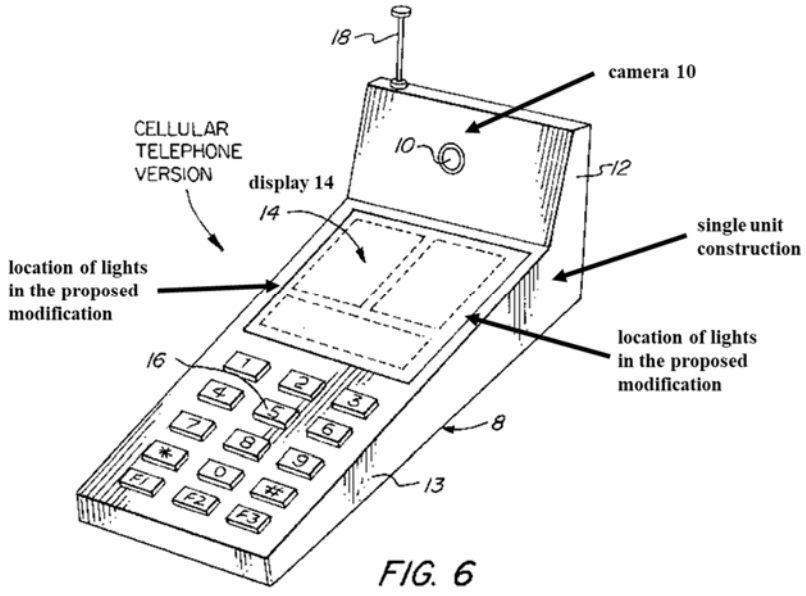
(Ex. PA-1, FIG. 6 (annotated to show the location of the series of lights comprising the "light source" in the proposed modification).) A POSITA would have understood that based on the upward angle of the camera in the cellular phone device that the work volume (the volume of space visible to the camera within which gestures are performed, or alternatively the space wherein gestures can be performed and detected) would be *above* the light source in the base portion of the phone. (Ex. PA-DEC, ¶ 88; Sections IV.E-G.) Thus, the proposed light source modification would be "adapted to direct illumination through a work volume above the light source." (Ex. PA-DEC, ¶ 88.)

A POSITA would have also had a reasonable expectation of success in implementing this modification because, as noted above, the modification would have merely involved incorporating known lighting components in the *Liebermann* cellular phone, similar to as taught in *Liebermann*'s public kiosk embodiment, which a POSITA would have understood uses similar hardware and processor components to implement the same gesture detection and communication method. (*Id.*, ¶ 89.) Indeed, integrating a light into a cellular phone was well known at the time of the invention. (*Id.*; Ex. PA-12, Abstract (disclosing a "portable telephone with flashlight"), 1:10-65 (describing how "[n]umerous innovations for illuminated telephones have been provided in the prior art," where each described illuminated telephone incorporates a light into the portable phone).) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann* cellular phone)) and materials (e.g., known light sources (*Liebermann* public telephone kiosk)) according to known methods (e.g., known light-aided gesture detection techniques) to yield the predictable result of a performing operations of providing a light source via a cellular phone implemented with a separate light source to directly illuminate through a work volume above the light source. (Ex. PA-DEC, ¶ 89.) *See KSR*, 550 U.S. at 416.

Accordingly, *Liebermann* discloses or suggests this limitation under the Requester's proposed constructions, the interpretations proposed by PO, and those found by the district court, such as those regarding "light source adapted to direct illumination through a work volume above the light source," "work volume above the light source," "adapted to," or the plain meaning of such terms. (*See* Sections IV.A, IV.E, IV.J.)

c. [1.c] providing a camera oriented to observe a gesture performed in the work volume, the camera being fixed relative to the light source; and

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 90-92.) *Liebermann* discloses that the cellular phone of FIG. 6 "contains a video camera, the lens 10 of which is disposed in the upright portion 12" and that "[i]n the base portion 13 are an LCD display panel 14 and a key pad 16 for dialing and other functions." (Ex. PA-1, 5:62-67.) As described in Section V.A.2.b and pictured in the image below, a POSITA would have found it obvious in view of *Liebermann*'s disclosures to implement a light source as a series of lights on each side of the display in the base portion of the phone. (Section V.A.2.b.) *Liebermann* discloses in FIG. 6 that the cellular phone embodiment is a single unit, so that the upright portion 12 and the base portion 13 are in fixed relationship to one another. (Ex. PA-1, FIG. 6.) A POSITA would have understood that in this fixed construction, the camera lens 10 is fixed relative to the light source pictured on each side of display 14. (Ex. PA-DEC, ¶ 91.) Thus, *Liebermann* discloses "providing a camera . . . the camera being fixed relative to the light source."



(Ex. PA-1, FIG. 6 (annotated to show the camera 10 and light source (alongside display 14) fixed relative to each other).)

Furthermore, *Liebermann* discloses that this camera is "oriented to observe a gesture performed in the work volume." *Liebermann* discloses that in all devices that implement the

claimed communication method, "[t]he deaf person uses sign language in front of the transmitter/receiver device containing the camera." (*Id.*, 6:42-44.) In the cellular phone of FIG. 6, "the deaf person is positioned so that the camera lens 10 will record the signing movement of the hands and fingers and body and facial motions and expressions." (*Id.*, 6:2-6.) *Liebermann* refers to such signing movements as gestures on numerous occasions. (*Id.*, 7:15, 12:25, 12:35, 12:67, 13:1, claim 21, FIG. 1, FIGS. 9-11.) A POSITA would have understood that forming a sequence of signs and signing movements as part of a sign language involves performing "a sequence of positions that conveys a meaning" (i.e., a gesture under Requester's proposed construction) as well as "movement of hands or other body parts that conveys meaning." (Ex. PA-DEC, ¶ 92; Section IV.D.) As discussed in Sections IV.E-G, the "work volume" of the '079 patent is the volume of space visible to the camera within which gestures are performed, or alternatively, the space wherein gestures can be performed and detected. (Sections IV.E-G.) For the cellular phone embodiment, a POSITA would have understood that the work volume area where gestures are performed is the area both above and in front of the camera lens 10 in which a user makes hand, face, and body gestures. (Ex. PA-DEC, ¶ 92.) *Liebermann* discloses that the communication method allows "[t]he deaf person [to] use[] sign language ***in front of*** the transmitter/receiver device containing the camera." (Ex. PA-1, 6:42-44.) *Liebermann* further discloses that the cellular phone of FIG. 6 is "supported in a stable position," which a POSITA would have understood to mean that the device is placed on a flat surface, such as a table in the ordinary situation where two-handed signing motions are conveyed, or occasionally in the palm of a stable hand when the other hand is signing into the device. (Ex. PA-1, 6:2-6, FIG. 6; Ex. PA-DEC, ¶ 92.) When the device is shown in this stable position, as displayed in FIG. 6, the upright portion 12 is sloped at an angle upwards, so that the camera lens 10 captures the area both in front of the camera and above the camera. (Ex. PA-1, FIG. 6.) Thus, *Liebermann* discloses "providing a camera oriented to observe a gesture performed in the work volume," where the gestures are signed movements and the work volume is the space simultaneously *above* and *in front of* the camera.

Accordingly, *Liebermann* discloses or suggests this limitation under the Requester's proposed construction, the interpretations proposed by PO, and those found by the district court, such as those regarding "gesture" and "work volume above the light source," or the plain meaning of such terms. (*See* Sections IV.D-E.)

d. [1.d] determining, using the camera, the gesture performed in the work volume and illuminated by the light source.

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 93-96.) As discussed in Section V.A.2.c, the signing gestures are performed in the "work volume" as construed in Section IV.E-G. (Section V.A.2.c.) As discussed in Section V.A.2.b, a POSITA would have found it obvious to include a light source comprising lights on each side of the display to provide illumination of the gestures. (Section V.A.2.b.) Thus, *Liebermann* discloses or suggests determining "the gesture performed in the work volume and illuminated by the light source." (Ex. PA-DEC, ¶ 94.)

Liebermann also discloses determining the gesture "using the camera" because the electronic communication method uses the camera's recorded gesture output as the input for the translation process which determines the meaning of gestures. (*Id.*, ¶ 95.) When using the *Liebermann*'s cellular phone, shown in FIG. 6, "[t]he device is supported in a stable position and the deaf person is positioned so that the ***camera lens 10 will record the signing movement of the hands and fingers and body and facial motions and expressions***. The ***signing motions captured by the camera are converted into digital data for processing by the translation software***, (i.e., artificial intelligence) to produce data representing numbers, words and phrases which are then combined into coherent sentences." (Ex. PA-1, 6:2-10.) This translation process involves initial processing, where "each of the frames containing a captured image undergoes a process whereby the image is collapsed into a small set of fixed identifiers," as well as additional processing at the central processing center, where the identifiers are interpreted as "letters, numbers and words" and converted to "standard sign language" and then to "spoken language which results in the equivalent text of the signed content." (*Id.*, 6:42-63.) Thus, a POSITA would have understood that the entire translation process to determine the meaning of signed gestures relies on the camera recording signed movements where frames with captured sign images can be isolated and analyzed. (Ex. PA-DEC, ¶ 96.)

3. Claim 4

a. The method according to claim 1 wherein detecting a gesture includes analyzing sequential images of the camera.

Liebermann discloses or suggests the limitations recited in claim 4. (Ex. PA-DEC, ¶¶ 97-101.) As discussed in Section V.A.2.d, *Liebermann* discloses detecting or determining a gesture using the camera of the cellular phone in FIG. 6.[4] (Section V.A.2.d.) *Liebermann* discloses that as part of the translation process, "[t]he ***images captured by the camera at 20-30 frames/second*** are processed by a digital device which does initial and extended image processing." (Ex. PA-1, 4:61-64.) These "images captured by the camera are of the finger and hand motions and of body motions and of facial expressions and motions"—that is, the motions that a POSITA would have understood to be gestures. (*Id.*, 6:43-47; Ex. PA-DEC, ¶ 98.) Then "***each of the frames containing a captured image undergoes a process whereby the image is collapsed into a small set of fixed identifiers***" as part of an initial processing step, and the remaining translation processing of these identifiers takes place after the data is sent to the central processing center. (Ex. PA-1, 6:42-63.) Thus, a POSITA would have understood that for the *Liebermann* method, "detecting a gesture includes analyzing sequential images of the camera" because the internal cellular phone processing takes in sequential camera images (at 20-30 frames/second) and analyzes them to form a reduced set of identifiers. (Ex. PA-DEC, ¶ 98.)

To the extent this limitation is read to require that detection of a *single* gesture includes analyzing sequential images of the camera, *Liebermann* also discloses or suggests this limitation. (*Id.*, ¶ 99.) A POSITA would have understood from *Liebermann*'s disclosures that ASL signs often incorporate motion, so that multiple sequential images captured by the camera must be analyzed together in order to interpret a single sign. (Ex. PA-1, 12:3-6 (disclosing an "***ASL*** to English translation algorithm" as shown in FIG. 16 to translate a deaf user's signs to a hearing user), 10:59-67 (disclosing that when signing in ASL, "[a]t any particular instant, one has to combine information about the handshape (Stokoe's dez), ***the motion (Stokoe's sig)*** and the spatial location of the hands relative to the rest of the body (Stokoe's tab)."), 10:54-56 (disclosing that implementing the *Liebermann* ASL to English translation method would require "linguistic analysis beyond what was recognized by William Stokoe in [Semiotics] and Human Sign Language, Mouton (197[2])" (*see* Ex. PA-8)); Ex. PA-8, 23 (providing an example of the "sig"

[4] There is no antecedent basis in claim 1 of the '079 patent for "detecting" a gesture in claim 4. However, claim 1 discloses "determining" a gesture. For purposes of this *ex parte* reexamination request, Requester assumes that "detecting" and "determining" have the same meaning and are used interchangeably in the context of the '079 patent.

(motion component) of a sign, noting that "the sig of the sign for [letter] *z* is a movement which traces a *z* with the fingertip"), 37 (providing a table of "sig" symbols, including for example "upward movement" and "downward movement").) Thus, a POSITA would have understood that *Liebermann* discloses "detecting a gesture includes analyzing sequential images of the camera" because sequential captured images (as described above) may need to be analyzed in conjunction with one another in order to fully understand the meaning and context of signed gestures (i.e., the "sig" of the sign). (Ex. PA-DEC, ¶ 100.)

At a minimum, in view of the disclosures of *Liebermann* and the knowledge of a POSITA (e.g., as reflected in the publications discussed above), it would have been obvious to a POSITA to analyze sequential captured images in conjunction with one another in order to fully understand the meaning and context of signed gestures. (Ex. PA-DEC, ¶ 101.) As discussed above, taking sequential captured images into account was a well-known, and indeed necessary, aspect of interpreting ASL signs. (*Id.*) As such, in order to implement *Liebermann*'s disclosure as to the interpretation of ASL signs, discussed above, a POSITA would have recognized that it would have been desirable, and indeed necessary, to analyze sequential captured images in conjunction with one another in order to fully understand the meaning and context of signed gestures, for substantially the same reasons discussed above. (*Id.*) As such, a POSITA would have been motivated to take such sequential images into account. (*Id.*) A POSITA would have had a reasonable expectation of success in implementing this modification because, as discussed above, this was a routine way of interpreting ASL signs, and a POSITA would have appreciated that the computer architecture of *Liebermann* would have allowed multiple images to be analyzed. (*See supra* Section V.A.2.a (discussing the computer architecture of *Liebermann*).) A POSITA would have had the skill to implement, and expectation of success in achieving such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann* cellular phone)) and elements (e.g., known ASL signs requiring a sequence of movements) according to known methods (e.g., known gesture and finger spelling detection techniques (*Liebermann*)) to yield the predictable result of a cellular phone analyzing sequential captured images in conjunction with one another in order to fully understand the meaning and context of signed gestures. (Ex. PA-DEC, ¶ 101.) *See KSR*, 550 U.S. at 416.

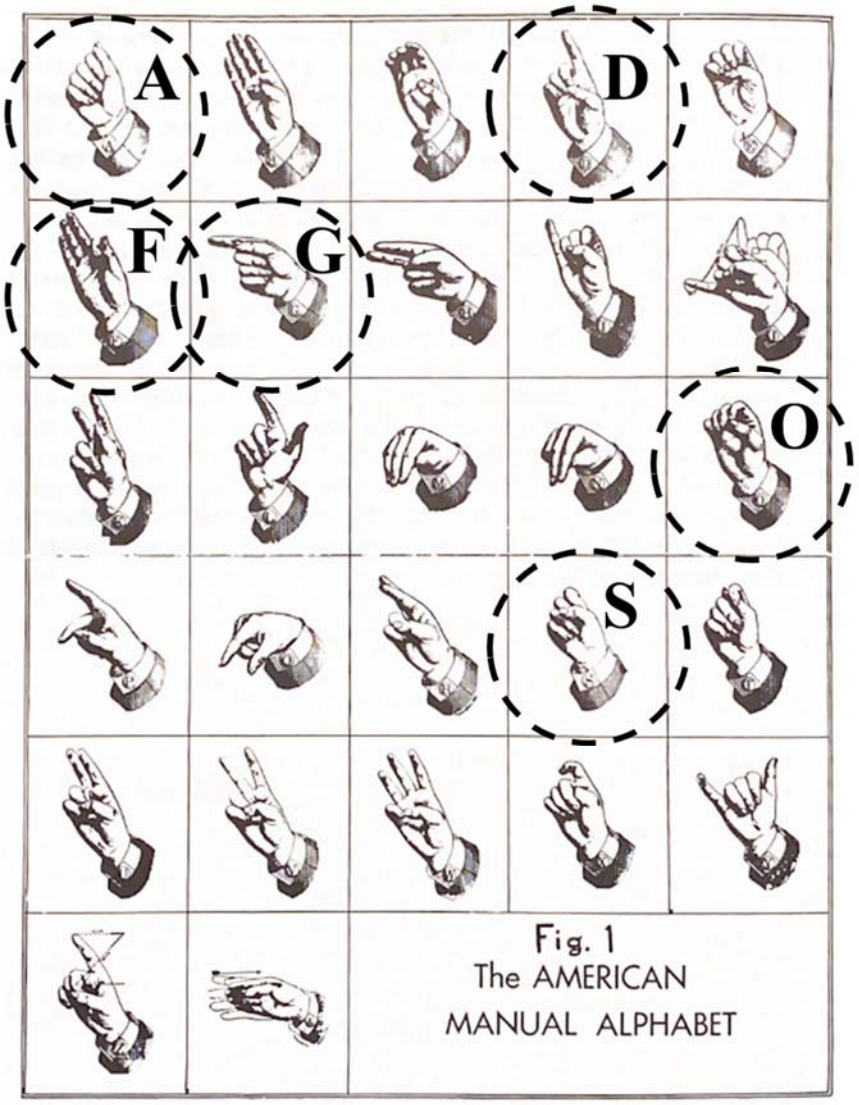
4. Claim 5

a. The method according to claim 1 wherein the detected gesture includes at least one of a pinch gesture, a pointing gesture, and a grip gesture.

Liebermann discloses or suggests the limitations recited in claim 5. (Ex. PA-DEC, ¶¶ 102-108.) *Liebermann* not only discloses detecting "***at least one*** of a pinch gesture, a pointing gesture, and a grip gesture," but discloses detection of all three types of gestures. In particular, *Liebermann* discloses that "another significant aspect of the invention is the ***requirement that finger spelling be captured by the camera, undergo the RDS process, and still be recognized*** once artificial intelligence procedures are invoked." (Ex. PA-1, 12:30-33.) *Liebermann* further discloses the "identification of the ***letters***, numbers and words" that have been signed, and discloses in FIG. 11 that if a signed word is not found in the signing dictionary, then letters are retrieved from a spelling dictionary to determine if the deaf user is finger spelling. (*Id.*, 6:53-57, FIG. 11.) Thus, a POSITA would have understood that the invention in *Liebermann* must be capable of detecting the full range of a signed alphabet in order to achieve the required finger spelling detection. (Ex. PA-DEC, ¶ 103.)

Liebermann further discloses detection of ASL signs via an "ASL to English translation algorithm," and notes that implementing the disclosed ASL to English translation method requires "linguistic analysis beyond what was recognized by William Stokoe in [Semiotics] and Human Sign Language, Mouton (197[2]), and Sign Language Structure, Linstok Press (1978)." (Ex. PA-1, 10:54-56, 12:3-6; *see also* Exs. PA-8, PA-9.) Thus, a POSITA would have understood that implementing the disclosed *Liebermann* method in the cellular phone—including the finger spelling as discussed above—required consulting Stokoe's sign language publications (or similar sources of such information) to ensure that, at a minimum, the cellular phone performs the disclosed *Liebermann* method to the full extent of the features described in such publications. For example, in both *Semiotics and Human Sign Language* and *Sign Language Structure*, Stokoe includes a diagram showing the letters of the American Manual Alphabet which are used in conjunction with ASL. (Ex. PA-8, 22; Ex. PA-9.) As pictured below, the American Manual Alphabet includes pinch, pointing, and grip gestures, and thus detection of finger spelling requires detection of a pinch gesture, a pointing gesture, and a grip gesture. (Ex. PA-8, 22; Ex. PA-9, 28; Ex. PA-DEC, ¶ 104.) For example, letters F and O each represent variations on a pinch gesture, where the thumb and index finger pinch together; letters D and G each represent pointing gestures

in different directions; and letters A and S represent variations on a grip gesture. (Ex. PA-9, 28; Ex. PA-DEC, ¶ 104.)



(Ex. PA-9, 28 (FIG. 1 (annotated to show pinch, pointing, and grip gestures used for finger spelling)).)

A POSITA would have understood that performing such signs would reflect "gestures" under Requester's interpretation because a user's hand would have to move from a previous sign or resting state and through a "sequence of positions" (*see* Section IV.D) to form the final hand shape representing each letter, where each letter has a distinct meaning. (Ex. PA-DEC, ¶ 105.) Likewise, a POSITA would have understood that such signs reflect "gestures" under the district court's construction order because the movement of a hand and fingers through a sequence of

positions to convey meaning is "movement of hands or other body parts that conveys meaning." (Section IV.D.)

To the extent each of the above signs disclose a singular position rather than "a sequence of positions that conveys a meaning" or "movement of hands or other body parts that conveys meaning" (i.e., a gesture, as explained in Section IV.D), *Liebermann* alternatively discloses such gestures through the incorporated Stokoe publications. (*Id.*) Stokoe states that a signing person can convey the meaning of a word by spelling that word via finger spelling. (Ex. PA-9, 3 ("The fingerspelled English word is a series of manual displays that stand in a one-to-one relationship with the letters of the English alphabet . . . Though the deaf person may never have heard a sound, such is the power of semiotic systems and the human mind, that this person may still have acquired the ability to use the written or fingerspelled word with as much symbolic force as any speaker of English can achieve.").) Stokoe also discloses that finger spelling can be used to sign "[p]ersonal and place names." (Ex. PA-8, 23.) From these disclosures, a POSITA would have understood that finger spelling would be used to sign abbreviations, and that to implement detection of this finger spelling in the *Liebermann* method, the system/process would need to be able to detect combinations of letters *in any order*. (Ex. PA-DEC, ¶ 106.) For example, Stokoe shows that letter B, shown above to the right of letter A in the table of American Manual alphabet letters, is a flat open hand. (Ex. PA-9, 28 (FIG. 1), 45 (describing the "b-hand of fingerspelling" as a "flat open hand").) A POSITA would have understood that conveying meanings "B-F" and "B-O" (e.g., as in an abbreviation) would require moving the hand and fingers through a sequence of positions in a pinching motion—that is, signing "B-F" and "B-O" each represent variations on a pinch gesture, where the thumb and index finger pinch together. (Ex. PA-9, 28; Ex. PA-DEC, ¶ 106.) Similarly, signing "B-D" and "B-G" each represent pointing gestures in different directions, and signing "B-A" and "B-S" each represent variations on a grip gesture. (Ex. PA-9, 28; Ex. PA-DEC, ¶ 106.) Thus, in this additional and alternative way, *Liebermann* also discloses through the incorporated Stokoe publications "a sequence of positions that conveys a meaning" and "movement of hands or other body parts that conveys meaning." (Section IV.D, Ex. PA-DEC, ¶ 1-6.)

To the extent *Liebermann* is read to not disclose detecting gestures as explained above based on the incorporated publications, a POSITA would have found it obvious to modify the *Liebermann* method such that it detects gestures including a sequence of positions that convey a meaning or movement of hands or other body parts that conveys meaning, like that recited in claim

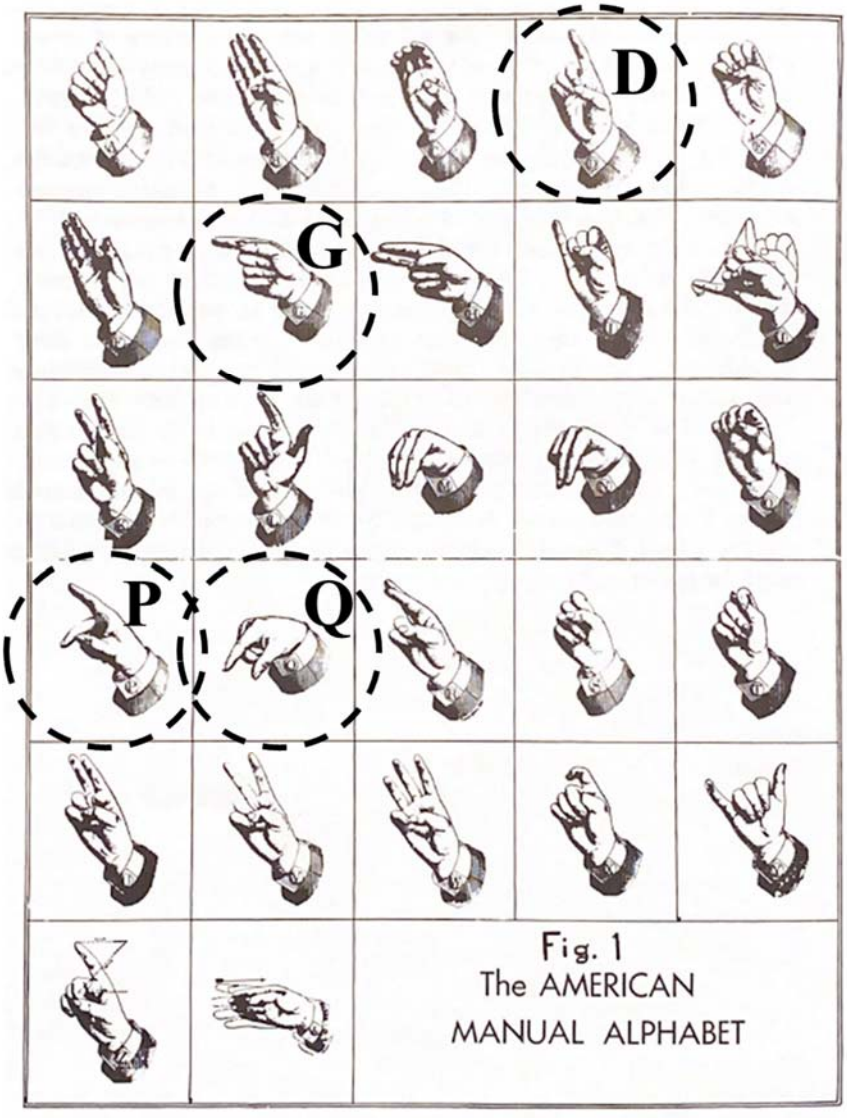
5. (Ex. PA-DEC, ¶ 107.) For example, as explained above, *Liebermann* discusses (and incorporates the disclosures of) *Semiotics and Human Sign Language* and *Sign Language Structure* by William Stokoe. (*See* Exs. PA-8, PA-9.) Thus, a POSITA would have been motivated to implement such features (including detection of gestures in the form of the American Manual Alphabet) with the *Liebermann* method because, as described above, (i) *Liebermann* discloses that detection of finger spelling is necessary, (ii) *Liebermann* discloses detection of ASL as a preferred sign language, and (iii) Stokoe's publications disclose that the American Manual Alphabet is the alphabet used to accomplish finger spelling in ASL. (Ex. PA-DEC, ¶ 107.) A POSITA would have appreciated the benefits of such an implementation because it would have allowed *Liebermann*'s process and system to detect gestures in the form of known hand/finger based communications. (*Id.*) A POSITA would have had a reasonable expectation of success in implementing such a modification because it would have involved the implementation of known computer-based design skills and technologies (e.g., programming, etc.) to detect additional signs (gestures) based on established and known techniques for recognizing similar signs. (*Id.*, ¶ 108.) Indeed, a POSITA would have had the skill to implement, and expectation of success in achieving such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann* cellular phone)) according to known methods (e.g., known gesture and finger spelling detection techniques (*Liebermann*) and known ASL signs for finger spelling (Stokoe, incorporated in *Liebermann*))) to yield the predictable result of a cellular phone implemented to detect the American Manual Alphabet in order to effect finger spelling translation as part of an electronic sign language communication system. (*Id.*) *See KSR* 550 U.S. at 416.

5. Claim 6

a. The method according to claim 1 further including determining the pointing direction of a finger in the work volume.

Liebermann discloses or suggests the limitations recited in claim 6. (Ex. PA-DEC, ¶¶ 109-110.) As discussed above in Section V.A.4 pertaining to claim 5, *Liebermann* discloses that the electronic communication method must be able to detect the signs that are used in finger spelling. (Section V.A.4.) Section V.A.4 also discusses how a POSITA would have understood from *Liebermann*'s disclosures the importance of consulting Stokoe's publications in order to

implement the *Liebermann* ASL detection method, and how these publications provide diagrams showing the letters of the American Manual Alphabet which are used to perform finger spelling in conjunction with ASL. (*Id.*) As pictured below, it was known that the American Manual Alphabet included a variety of gestures with fingers pointing in various directions. (Ex. PA-9, 28; *see also* Ex. PA-8, 22.) For example, letter D involves pointing upwards; letter G involves pointing left (if signing with a right hand); letter P involves pointing upwards at an angle; and letter Q involves pointing downwards at an angle. (Ex. PA-9, 28; Ex. PA-DEC, ¶ 110.)



(Ex. PA-9, 28 (FIG. 1 (annotated to show pointing signs in different directions used for finger spelling)).) A POSITA would have recognized that in order to clearly distinguish between the finger spelling of these letters, the disclosed method of *Liebermann* would need to be able to

determine which direction the finger points in the work volume. (Ex. PA-DEC, ¶ 110.) To the extent that *Liebermann* does not disclose these signs found in the incorporated publications, a POSITA would have found it obvious to modify the *Liebermann* method in view of *Liebermann*'s disclosures regarding these fundamental sign language texts for the same reasons as discussed for claim 5. (Section V.A.4.)

6. Claim 7

a. The method according to claim 1 further including providing a target positioned on a user that is viewable in the work volume.

Liebermann discloses or suggests the limitations recited in claim 7. (Ex. PA-DEC, ¶¶ 111-113.) *Liebermann* discloses that "another significant aspect of the invention is the requirement that finger spelling be captured by the camera, undergo the RDS process, and still be recognized once artificial intelligence procedures are invoked." (Ex. PA-1, 12:30-33.) *Liebermann* discloses that because "[t]his task can be difficult because the frame grabber has to capture the signed gesture against the ambient surroundings, other body parts of the signing person, and clothes," it is advantageous to use "***special gloves which allow discrimination of the hands from the background*** for the image processing system." (*Id.*, 12:34-39.) FIGS. 13 and 14 illustrate "the benefit in using special gloves to enhance the ability of the system to recognize important detail of the hand shapes during the actual gesturing of sign language." (*Id.*, 12:40-43, FIGS. 13-14.) *Liebermann* discloses an example where "the fingers of the right hand can be distinctly green and the fingers of the left hand are distinctly blue," and each glove may have "a third color (typically red) for left and right palm areas," which "allows hand shape and finger details to be seen whenever the hand is closed vs. opened and when palm is disposed toward the camera vs. palm away." (*Id.*, 12:46-52.) FIG. 13A illustrates a front view of these gloves and is reproduced below.

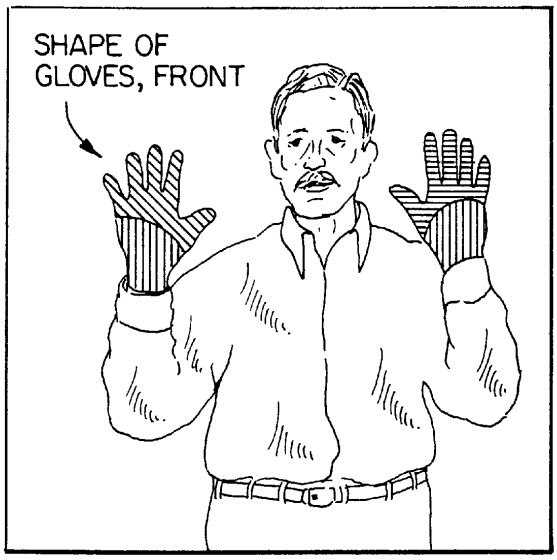


FIG. 13A

(*Id.*, FIG. 13A; Ex. PA-DEC, ¶ 112.) A POSITA would have understood that this glove and its specially marked colors to aid in the detection of signs are targets as contemplated by the '079 patent, which describes targets as "special colors or shapes" or "retro-reflective materials and other materials to augment the contrast of objects used in the application." (Ex. PAT-A, 3:18-20, 3:63-65; Ex. PA-DEC, ¶ 113.) Thus, *Liebermann* discloses "a target positioned on a user that is viewable in the work volume." (Ex. PA-DEC, ¶ 113.)

7. Claim 8

a. The method according to claim 1 further including determining the three-dimensional position of a point on a user.

Liebermann discloses or suggests the limitations recited in claim 8. (Ex. PA-DEC, ¶¶ 114-118.) *Liebermann* discloses that the electronic communication method must determine the location or position of points on a user. Because "ASL is a visual-spatial language requiring simultaneous, multiple, dynamic articulations," "[a]t any particular instant, one has to combine information about the handshape (Stokoe's 'dez'), the motion (Stokoe's 'sig') and the ***spatial location of the hands*** relative to the rest of the body (Stokoe's 'tab')." (Ex. PA-1, 10:59-64 (internal quotations added).) As shown in FIG. 9 (reproduced below), which displays "a schematic representation of the modules of the artificial intelligence for converting signing into speech," the disclosed method requires "***calculating centers of gravity for both hands***," which involves finding

an "***FFT [fast Fourier transform] of paths of the hands***" as well as performing an "***explicit path analysis***" of the hands. (*Id.*, 4:31-32, FIG. 9.) FIG. 9 discloses in other portions of the conversion process that a "***2 hand FFT and their location***" are determined by the static gesture manager, and a "***right hand FFT***" is determined by the spelling mode manager. (*Id.*, FIG. 9.) A POSITA would have understood that calculating the center of gravity of a hand, performing a fast Fourier transform, and conducting path analysis all require determining the position of a point on the user's hand, which is a "point on a user." (Ex. PA-DEC, ¶ 115.) Furthermore, *Liebermann* discloses or suggests in numerous places that coordinates of the hands and other body parts are determined. (Ex. PA-1, 13:22-23 (suggesting that "coordinates" of signs are determined), 7:44-9:27 (disclosing an algorithm for feature tracking, which detects the location of various parts of the head, torso, arms, and legs).)

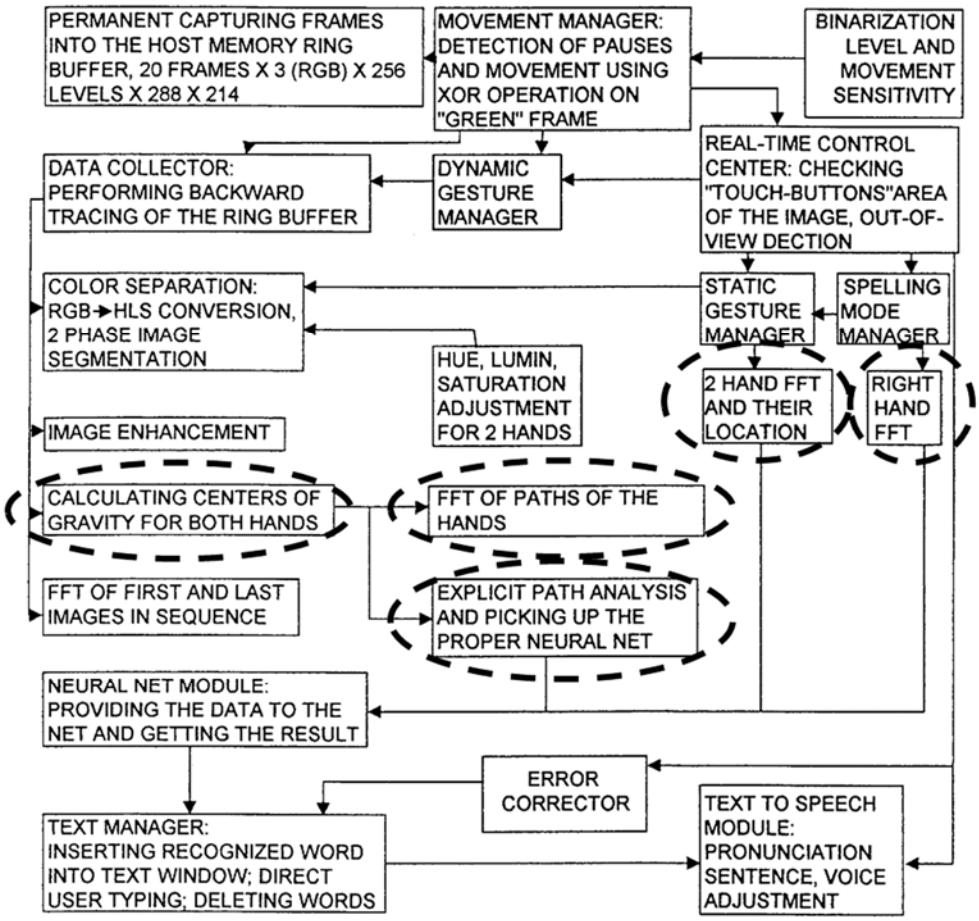


FIG. 9

(*Id.*, FIG. 9 (annotated to show the portions of the sign to speech conversion, each of which involve determining points on a user, as discussed above).)

While *Liebermann* does not explicitly disclose "determining the ***three-dimensional*** position of a point on a user," a POSITA would have found it obvious to modify the *Liebermann* position detection in view of *Liebermann*'s other disclosures to further determine three-dimensional position points on a user. (Ex. PA-DEC, ¶ 116.) *Liebermann* discloses that "***three dimensional video cameras*** have been developed" and "[t]he use of such devices may facilitate recognition of signing motions by enhancing spatial differences." (Ex. PA-1, 13:29-31.) Three-dimensional video cameras were well known at the time of the invention, and a POSITA would have understood that these cameras detect three-dimensional position data. (*See, e.g.*, Ex. PA-10, Title ("Optical System for Single Camera Stereo Video"), Abstract ("Alternatively, the images can be interrogated by a computer system for generating ***three dimensional position data***."); Ex. PA-DEC, ¶ 117.) A POSITA would have been motivated to implement a three-dimensional camera that captures three-dimensional position data in light of *Liebermann*'s disclosure that these cameras may beneficially "enhance[] spatial differences," as well as *Liebermann*'s reference to sign language publications by William Stokoe (*see* Section V.A.3) that provide additional information on the "sig" (motion) component of signs. (Ex. PA-1, 13:29-31; Ex. PA-DEC, ¶ 117; *see also* Section V.A.3 (describing Stokoe's table of "sig" movements).) In particular, Stokoe notes that a particular sign may involve "upward movement," "downward movement," "rightward movement," "leftward movement," "movement toward signer," or "movement away from signer," which a POSITA would have understood to be the *x*, *y*, and *z* directions. (Ex. PA-8, 37.) Thus, a POSITA would have understood the benefit of modifying *Liebermann*'s position detection and path analysis (as described above) by implementing a three-dimensional camera in the cellular phone to capture this three-dimensional position and movement data (and more specifically, position and movement data defined with respect to three perpendicular axes *x*, *y*, and *z* (*see* Section IV.I)). (Ex. PA-DEC, ¶ 117.)

A POSITA would have had a reasonable expectation of success in implementing this modification in the *Liebermann* cellular phone because *Liebermann* discloses that such a modification would have been both possible and beneficial. (Ex. PA-1, 13:29-31; Ex. PA-DEC, ¶ 118.) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving such a modification because it would have involved applying known technologies (e.g.,

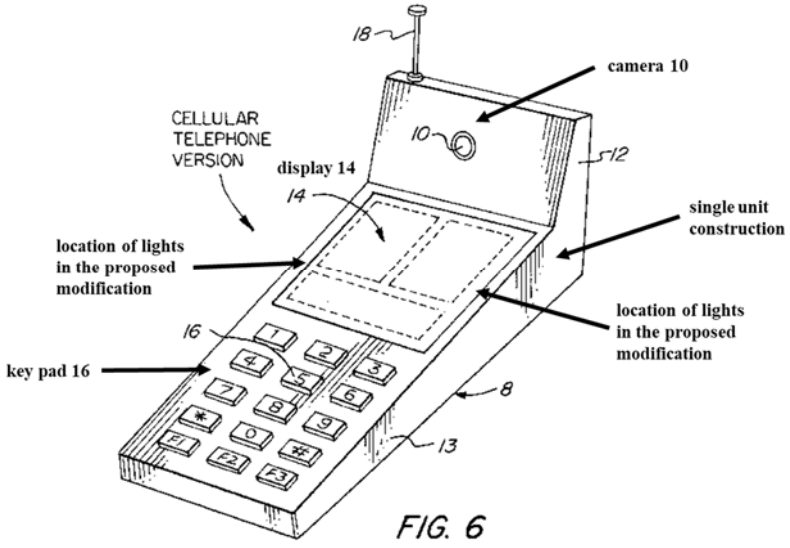
known gesture detection technology) and materials (e.g., known three-dimensional cameras) according to known methods (e.g., known position detection techniques) to yield the predictable result of a cellular phone with a three-dimensional camera that uses the *Liebermann* position detection method to determine three-dimensional positions of a point on the user in the course of sign detection. (Ex. PA-DEC, ¶ 118.) *See KSR* 550 U.S. at 416.

Accordingly, *Liebermann* discloses or suggests this limitation under both the Requester's proposed construction, and the plain meaning proposed by PO and found by the district court for the claimed "three-dimensional position" term. (*See* Section IV.I.)

8. Claim 9

a. The method according to claim 1 wherein the camera and the light source are positioned in fixed relation relative to a keypad.

Liebermann discloses or suggests the limitations recited in claim 9. (Ex. PA-DEC, ¶¶ 119-120.) As discussed in Section V.A.2.b, a POSITA would have found it obvious to include a light source comprising lights on each side of the display in the base portion of the phone. (Section V.A.2.b.) *Liebermann* also discloses that the key pad 16 is also in the base portion 13, while the camera lens 10 is in the upright portion 12 of the cellular phone. (Ex. PA-1, 5:62-67, FIG. 6.) As discussed in Section V.A.2.c, a POSITA would have understood from the disclosed diagram of FIG. 6 that *Liebermann*'s cellular phone embodiment has a fixed, single unit construction. (Section V.A.2.c.) Thus, a POSITA would have understood that *Liebermann*'s cellular phone (as modified above) would have been configured such that that "the camera and the light source are positioned in fixed relation relative to a keypad." (Ex. PA-DEC, ¶ 120.) FIG. 6 is reproduced below illustrates this fixed relationship that would have been applicable to the modified *Liebermann* phone.



(Ex. PA-1, FIG. 6 (annotated to show the components of the base and upright portions).)

9. Claim 11

Liebermann discloses or suggests the limitations recited in claim 11. (Ex. PA-DEC, ¶¶ 121-130.)

a. [11.a] A computer apparatus comprising:

Liebermann discloses or suggests this preamble to the extent limiting. (Ex. PA-DEC, ¶¶ 121-122.) *Liebermann* discloses a "portable transmitter/receiver," as shown in FIG. 6, that is in the "form of a cellular telephone." (Ex. PA-1, 4:21-22, 5:62-63.) For the reasons discussed for claim 1.a in Section V.A.2.a, a POSITA would have understood that this cellular phone contains a computer within the cellular phone frame and is therefore a "computer apparatus." (Section V.A.2.a; Ex. PA-DEC, ¶ 122.) The cellular phone has a video camera, an LCD display, a key pad, and "an antenna 18 for the device so that it may be transported and communicate as a wireless remote or through a cellular telephone network." (Ex. PA-1, 5:62-6:2.) Through this wireless connection, the cellular phone performs local computer processing in conjunction with a remote "dedicated central computer facility" to "provide a novel electronic communication system for use by deaf persons to enable them to communicate by signing" with hearing persons. (*Id.*, 3:11-13, 5:62-6:14.)

b. [11.b] a light source adapted to illuminate a human body part within a work volume generally above the light source;

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 123-125.) *Liebermann* discloses or suggests this limitation for similar reasons as those explained for claim 1.b in Section V.A.2.b. (Section V.A.2.b.) While claim 11.b additionally recites that the light source is adapted to illuminate a "human body part," the explanation provided in Section V.A.2.b describes how the light source (a modification to include a separate light source comprising lights along each side of the display) is adapted to and *designed for* illumination of a user's hands, face, and body (which perform gestures within a work volume) by transmitting light directly onto these body parts. (*Id.*; *see also* Sections IV.B, IV.J; Ex. PA-DEC, ¶ 124.) Thus, a POSITA would have understood that the "light source [is] adapted to illuminate a human body part within a work volume." (Ex. PA-DEC, ¶ 125.) Claim 1.b recites that the illumination of the work volume is "above the light source," while claim 11.b recites that the work volume is "generally above the light source," but a POSITA would have understood that if *Liebermann* discloses a work volume above a light source, it also discloses a work volume *generally* above the light source. (Section V.A.2.b; Ex. PA-DEC, ¶ 125.) Accordingly, *Liebermann* discloses or suggests this limitation under the Requester's proposed constructions, the interpretations proposed by PO, and those found by the district court, such as those regarding "light source adapted to illuminate a human body part generally above the light source," "work volume generally above the light source," and "adapted to," or the plain meaning of such terms. (*See* Sections IV.B, IV.F.)

c. [11.c] a camera in fixed relation relative to the light source and oriented to observe a gesture performed by the human body part in the work volume; and

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 126-127.) *Liebermann* discloses or suggests this limitation for similar reasons as those explained for claim 1.c in Section V.A.2.c. (Section V.A.2.c.) While claim 11.c additionally recites that the gesture performed in the work volume is "performed by the human body part," the explanation provided for claim 1.c in Section V.A.2.c describes how the gesture is performed by a human body part. (Section V.A.2.c.)

d. [11.d] a processor adapted to determine the gesture performed in the work volume and illuminated by the light source based on the camera output.

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 128-130.) *Liebermann* discloses or suggests this limitation for similar reasons as those explained for claims 1.a and 1.d in Sections V.A.2.a and V.A.2.d. (Sections V.A.2.a, V.A.2.d.) Section V.A.2.d explains how the *Liebermann* electronic communication method "determine[s] the gesture performed in the work volume and illuminated by the light source based on the camera output." (Section V.A.2.d.) Section V.A.2.a explains how a POSITA would have found it obvious to implement the entire *Liebermann* method in the internal computer of the cellular phone. (Section V.A.2.a.) A POSITA would have recognized that such a computer would have included "a processor" to perform the processing operations as discussed and claimed (e.g., the gesture determination (*see* Section IV.J)), perform the processing as known in the art. (Ex. PA-11, 1:6-11 (disclosing state of the art knowledge of a mobile telephone that has a "controller unit 250 [which] includes a program memory 251 which provides instructions to a central processor unit (CPU) 252 for controlling the various [phone] operating features and functions," where the phone's processing functions may be "programmed in the program memory 251" and the "CPU 252 is a microprocessor"); Ex. PA-DEC, ¶ 129.) Thus, for the reasons discussed here and in Sections V.A.2.a and V.A.2.d, a POSITA would have found it obvious to implement the computer apparatus (cellular phone) with a processor adapted to, or programmed to, "determine[s] the gesture performed in the work volume and illuminated by the light source based on the camera output." (Sections V.A.2.a, V.A.2.d; Ex. PA-DEC, ¶ 129.)

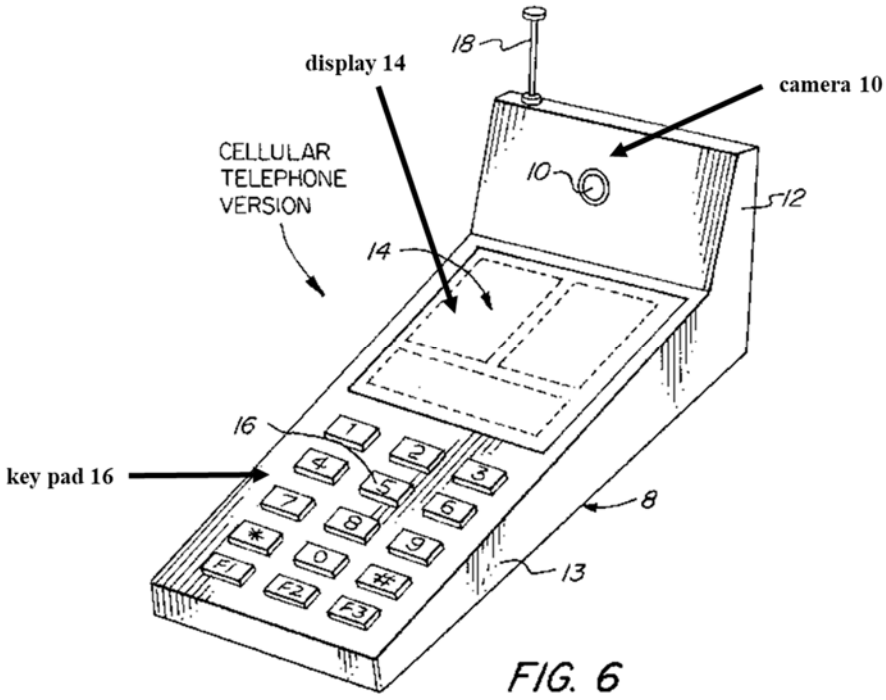
As explained, when this limitation is construed under 35 U.S.C. § 112, ¶ 6, *Liebermann* also discloses software running on a processor in order to perform this gesture determination function. (Section IV.H; Ex. PA-DEC, ¶ 130.) In particular, a POSITA would have understood that the processor would be adapted to, or programmed to, perform the required gesture determination processing by running known software that *Liebermann* discloses. (Ex. PA-1, 4:6-9 (disclosing "computer software for . . . translating functions"), 6:6-10 ("The signing motions captured by the camera are converted into digital data for processing by the translation software . . . to produce data representing numbers, words and phrases which are then combined into coherent sentences."), 7:14-17, 7:45-49 ("Software presently used for [translation of the signing into and

from digital text] is appended hereto and is utilized with Borland C++."); Ex. PA-DEC, ¶ 130.) Accordingly, *Liebermann* discloses or suggests this limitation under both the Requester's proposed construction and the plain meaning proposed by PO and found by the district court for the claimed "processor . . . ." (*See* Section IV.H.)

10. Claim 12

a. The computer apparatus of claim 11 further including a display and a keyboard, wherein the work volume is above the keyboard and in front of the display.

Liebermann discloses or suggests the limitations recited in claim 12. (Ex. PA-DEC, ¶¶ 131-132.) *Liebermann* discloses that the cellular phone apparatus includes a display 14 and a keyboard (key pad) 16. (Ex. PA-1, FIG. 6, 5:62-67.) Because of the shape of the cellular phone of FIG. 6 when placed in a stable position, a POSITA would have understood that the work volume of FIG. 6 is "above the keyboard and in front of the display." (Ex. PA-DEC, ¶ 132.) The image below more clearly depicts the cellular phone elements.



(Ex. PA-1, FIG. 6 (annotated to depict the relationship between the keypad 16, display 14, and camera 10).) *Liebermann* discloses that both the base portion 13 and the upright portion 12 slope

upwards at an angle. (Ex. PA-1, FIG. 6.) In order for the device to be able to detect a signing user's gestures, a POSITA would have understood that the signing user would have to gesture *above* the base portion, *above* the upright portion (because of the relatively short height of the upright portion), but also *in front of* the upright portion (so that the gestures may be detected by the camera lens 10) and *in front of* the base portion (because of the relatively shallow distance between the near end of the base portion and the camera, which does not allow enough space to sign.) (Ex. PA-DEC, ¶ 132.) Thus, a POSITA would have recognized that in the FIG. 6 cellular phone as disclosed by *Liebermann*, "the work volume is above the keyboard and in front of the display," but also in front of the keyboard and above the display, as the work volume must be both above and in front of all components of the stable cellular phone in order to effectively communicate via sign language. (*Id.*, ¶ 132.)

11. Claim 17

a. The computer apparatus of claim 11 further including a target that is viewable by the camera when in the work volume.

Liebermann discloses or suggests the limitations recited in claim 17 for the same reasons as those explained for claim 7 and claim 12. (Ex. PA-DEC, ¶¶ 133-134; Sections V.A.6, V.A.10.) While claim 7 recites that the target is "viewable in the work volume," claim 17 recites that the target is "viewable *by the camera when* in the work volume." (Ex. PAT-A, claims 7, 17.) The analysis above for claim 7 explains how *Liebermann*'s glove with specially marked colors are targets viewable in the work volume as contemplated by the '079 patent, which describes targets as "special colors or shapes" or "retro-reflective materials and other materials to augment the contrast of objects used in the application." (Section V.A.6; Ex. PAT-A, 3:18-20, 3:63-65; Ex. PA-DEC, ¶ 134.) A POSITA would have understood that if *Liebermann* discloses a target on a user that is viewable in the work volume, it also discloses a target on a user that is viewable by the camera when in the work volume, as the work volume is the area where gestures are performed within the camera's view. (Ex. PA-DEC, ¶ 134; *see also* Section V.A.10.)

12. Claim 18

a. The computer apparatus of claim 11 wherein the determined gesture includes a pinch gesture.

Liebermann discloses or suggests the limitations recited in claim 18. (Ex. PA-DEC, ¶ 135.) *Liebermann* discloses or suggests these limitations for similar reasons to those explained for claim 5. (Section V.A.4.) In particular, Section V.A.4 explains how *Liebermann* discloses that "the detected gesture includes . . . a pinch gesture." (*Id.*) The same reasoning explained for claim 5 is applicable here. (*Id.*)

13. Claim 19

a. The computer apparatus of claim 11 wherein the determined gesture includes a pointing gesture.

Liebermann discloses or suggests the limitations recited in claim 19. (Ex. PA-DEC, ¶ 136.) *Liebermann* discloses or suggests these limitations for similar reasons to those explained for claim 5. (Section V.A.4.) In particular, Section V.A.4 explains how *Liebermann* discloses that "the detected gesture includes . . . a pointing gesture." (*Id.*) The same reasoning explained for claim 5 is applicable here. (*Id.*)

14. Claim 20

a. The computer apparatus of claim 11 wherein the determined gesture includes a grip gesture.

Liebermann discloses or suggests the limitations recited in claim 20. (Ex. PA-DEC, ¶ 137.) *Liebermann* discloses or suggests these limitations for similar reasons to those explained for claim 5. (Section V.A.4.) In particular, Section V.A.4 explains how *Liebermann* discloses that "the detected gesture includes . . . a grip gesture." (*Id.*) The same reasoning explained for claim 5 is applicable here. (*Id.*)

15. Claim 21

Liebermann discloses or suggests the limitations recited in claim 21. (Ex. PA-DEC, ¶¶ 138-144.)

a. [21.a] A computer implemented method comprising:

Liebermann discloses or suggests this preamble to the extent limiting for the same reasons as explained for claim 1.a in Section V.A.2.a. (Ex. PA-DEC, ¶ 138; Section V.A.2.a.)

b. [21.b] providing a camera oriented to observe a gesture performed in a work volume above the camera;

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 139-140.) *Liebermann* discloses or suggests this limitation for similar reasons as those explained for claim 1.c in Section V.A.2.c. (Section V.A.2.c.) In particular, Section V.A.2.c. describes how *Liebermann* discloses "providing a camera oriented to observe a gesture performed in a work volume." (*Id.*) While claim 1.c does not recite that the "work volume [is] above the camera," the explanation provided in Section V.A.2.c clearly describes how the camera is oriented so that the work volume is the space simultaneously *above* and *in front of* the camera. (*Id.*) Thus, a POSITA would have understood that *Liebermann* discloses or suggests the limitations recited in claim 21.b for the reasons explained for claim 1.c in Section V.A.2.c. (*Id.*; Ex. PA-DEC, ¶ 140.) Accordingly, *Liebermann* discloses or suggests this limitation under the Requester's proposed constructions, the plain meanings proposed by PO, and those constructions found by the district court for the claimed "gesture" and "work volume above the camera." (*See* Sections IV.D, IV.G.)

c. [21.c] providing a light source in fixed relation relative to the camera and adapted to direct illumination through the work volume; and

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 141-142.) *Liebermann* discloses or suggests this limitation for similar reasons as those provided for claims 1.b and 1.c in Sections V.A.2.b and V.A.2.c. (Sections V.A.2.b, V.A.2.c.) For the reasons explained for claim 1.b in Section V.A.2.b, a POSITA would have found it obvious to modify the *Liebermann* cellular phone to "provid[e] a light source . . . adapted to direct illumination through the work volume." (Section V.A.2.b; *see also* Sections IV.A, IV.C.) For the reasons explained for claim 1.c in Section V.A.2.c, *Liebermann* discloses or suggests that this "light source [is] in fixed relation relative to the camera." (Section V.A.2.c.) Thus, a POSITA would have understood that *Liebermann*

discloses or suggests the limitations recited in claim 21.c for the same reasons as those explained for claims 1.b and 1.c in Sections V.A.2.b and V.A.2.c. (Sections V.A.2.b, V.A.2.c.; Ex. PA-DEC, ¶ 142.) Accordingly, *Liebermann* discloses or suggests this limitation under both the Requester's proposed constructions, and the plain meanings proposed by PO and found by the district court, for the claimed "light source . . ." and "adapted to." (*See* Sections IV.C, IV.J.)

d. [21.d] detecting, using the camera, a gesture performed by at least one of a user's fingers and a user's hand in the work volume.

Liebermann discloses or suggests this limitation. (Ex. PA-DEC, ¶¶ 143-144.) *Liebermann* discloses or suggests this limitation for the same reasons as those provided for claim 1.d in Section V.A.2.d. (Section V.A.2.d.) While claim 21.d additionally recites that the "gesture [is] performed by at least one of a user's fingers and a user's hand," a POSITA would have understood that the detected gestures in Section V.A.2.d encompass signs that are performed by a user's fingers and hands, as well as facial gestures, body gestures, and the like. (*Id.*; Ex. PA-DEC, ¶ 144.) Thus, *Liebermann* discloses or suggests this limitation because it recites detection of a subset of the gestures disclosed in claim 1.d and explained in Section V.A.2.d. (Section V.A.2.d; Ex. PA-DEC, ¶ 144.)

16. Claim 24

a. The method according to claim 21 wherein detecting a gesture includes analyzing sequential images of the camera.

Liebermann discloses or suggests the limitations recited in claim 24. (Ex. PA-DEC, ¶ 145.) *Liebermann* discloses or suggests these limitations for the reasons explained for claim 4. (Section V.A.3.)

17. Claim 25

a. The method according to claim 21 wherein the detected gesture includes at least one of a pinch gesture, a pointing gesture, and a grip gesture.

Liebermann discloses or suggests the limitations recited in claim 25. (Ex. PA-DEC, ¶ 146.) *Liebermann* discloses or suggests these limitations for the reasons explained for claim 5. (Section V.A.4.)

18. Claim 26

a. The method according to claim 21 further including determining the pointing direction of one of the user's fingers using the first and second cameras.

Liebermann discloses or suggests the limitations recited in claim 26. (Ex. PA-DEC, ¶¶ 147-148.) *Liebermann* discloses or suggests these limitations for similar reasons to those explained for claim 6. (Section V.A.5.) While claim 6 of the '079 patent recites "determining the pointing direction of ***a finger*** in the work volume," claim 26 recites "determining the pointing direction of ***one of the user's fingers using the first and second cameras***."[5] (Ex. PAT-A, claims 6, 26.) The explanation for claim 6 describes how *Liebermann* discloses "determining the pointing direction of one of the user's fingers." (Section V.A.5.) *Liebermann* also discloses determining the pointing direction "using the first and second cameras," noting that "[t]he illustrated embodiments all utilize a single video camera[]," but "[i]t may be desirable to utilize more than one camera to allow the signing person 'free' movement in his or her environment to track down spatial positions in that environment." (Ex. PA-1, 13:4-8.) While the *Liebermann* cellular phone does not contain two cameras, a POSITA would have found it obvious to modify the cellular phone so that it has at least "first and second cameras" in light of *Liebermann*'s disclosures about the benefits of such an arrangement. (Ex. PA-DEC, ¶ 148.) A POSITA would have had a reasonable expectation of success in implementing this modification because it would have involved modifying the *Liebermann* cellular phone in a manner that *Liebermann* prescribes. (*Id.*) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann* cellular phone)) and materials (e.g., known multiple cameras (*Liebermann*)) according to known methods (e.g., known multi-camera gesture

[5] Claim 26 lacks an antecedent basis for the "second camera[]." For purpose of this request only, Requester construes Claim 26 to require at least two cameras.

detection techniques) to yield the predictable result of a cellular phone implemented with multiple cameras for use in an electronic communication system. (*Id.*) *See KSR* 550 U.S. at 416.

19. Claim 27

a. The method according to claim 21 further including providing a target positioned on the user that is viewable by the camera.

Liebermann discloses or suggests the limitations recited in claim 27. (Ex. PA-DEC, ¶¶ 149-150.) *Liebermann* discloses or suggests these limitations for the same reasons as those explained for claim 7. (Section V.A.6.) While claim 7 recites that the target is "viewable in the work volume," claim 27 recites that the target is "viewable by the camera." (Ex. PAT-A, claims 7, 27.) However, a POSITA would have understood that if *Liebermann* discloses a target on a user that is viewable in the work volume, it also discloses a target on a user that is viewable by the camera, as the work volume is the area where gestures are performed within the camera's view. (Ex. PA-DEC, ¶ 150.)

20. Claim 28

a. The method according to claim 21 further including determining the three-dimensional position of a point on at least one of the user's hand and the user's fingers.

Liebermann discloses or suggests the limitations recited in claim 28. (Ex. PA-DEC, ¶¶ 151-152.) *Liebermann* discloses or suggests these limitations for the reasons explained for claim 8. (Section V.A.7.) While claim 8 recites "determining the three-dimensional position of a point ***on a user***" and claim 28 recites "determining the three-dimensional position of a point ***on at least one of the user's hand and the user's fingers***," the explanation for claim 8 in Section V.A.7 explains how *Liebermann* discloses both of these limitations. (Ex. PA-DEC, ¶ 152.)

21. Claim 30

a. The method according to claim 21 wherein the camera and the light source are positioned in fixed relation relative to a keypad.

Liebermann discloses or suggests the limitations recited in claim 30. (Ex. PA-DEC, ¶ 153.) *Liebermann* discloses or suggests these limitations for the reasons explained for claim 9. (Section V.A.8.)

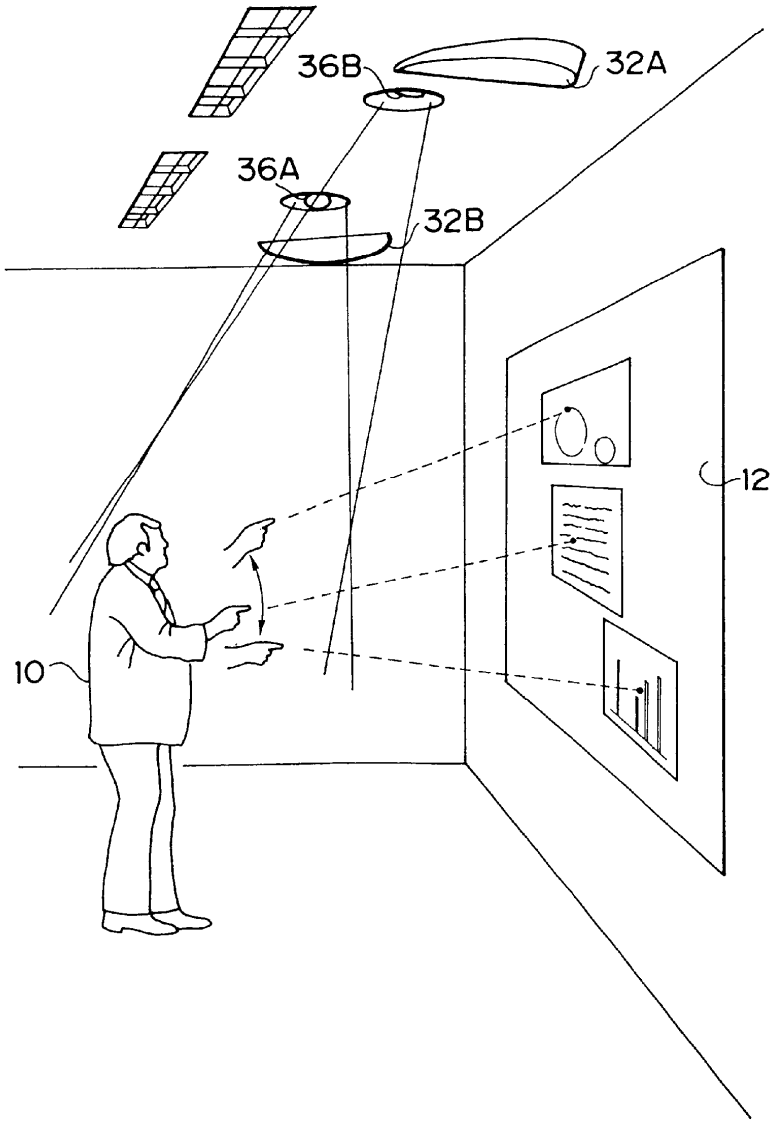
B. SNQ2: *Liebermann* in view of *Harakawa*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* in view of *Harakawa* discloses or suggests the limitations of claims 6 and 26 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-58, 154-159.)

1. Overview of *Harakawa*

Harakawa discloses "a large-screen display 12 [that] is built into a wall surface in a place at which an information inputting person 10 . . . arrives. (Ex. PA-2, 15:11-14.) The display, which may be "a liquid crystal display (LCD), a plasma display, a cathode ray tube (CRT) [or] an optical fiber display," connects to an information processor "composed of a personal computer or the like." (*Id.*, 15:14-19.) "[T]he information inputting person 10 arrives at the place (information input space) shown in FIG. 1 in front of the display 12," and then "points to a position on the display surface of the display 12." (*Id.*, 15:23-27.) By making "a click motion," the information inputting person may "give[] various instructions to the information processor" which "allows various types of processing to be executed." (*Id.*, 15:28-31.) *Harakawa* further discloses that the invention includes a "plurality of near-infrared light illuminators 32A and 32B" and a "plurality of video cameras 36A and 36B," each of which is oriented to illuminate or capture the information inputting person in the information input space. (*Id.*, 15:42-16:30.) Many of these elements are illustrated in FIG. 1 of *Harakawa*, which is reproduced below.

F I G. 1

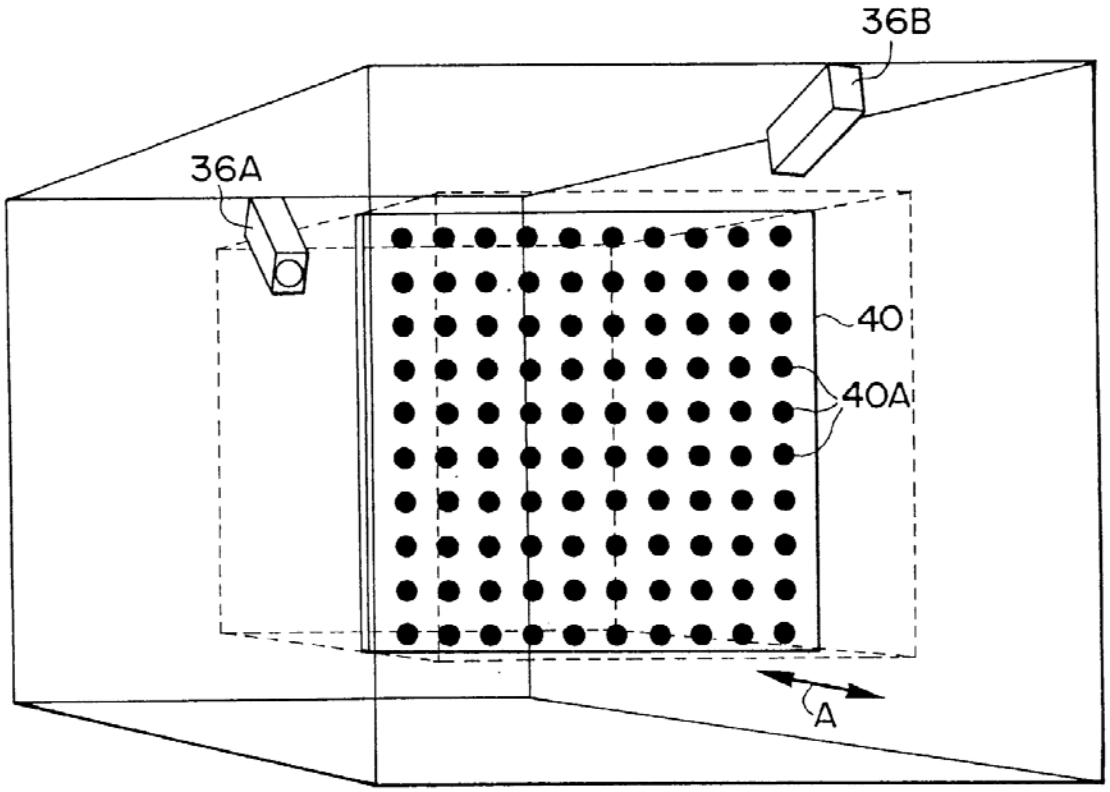


(*Id.*, FIG. 1.)

In a series of lattice point initialization steps, the three-dimensional coordinates (x, y, z) in the information input space are mapped to the two-dimensional positions of the images A and B, which are the areas captured by cameras 36A and 36B, respectively. (*Id.*, 16:52-17:59.) This initialization is accomplished by moving a transparent mark plate 40 with an equally spaced matrix of marks 40A through the information input space, and at each step (i) calculating the three-

dimensional coordinates of marks 40A at the mark plate 40's current position, and (ii) extracting the two-dimensional positions of the marks 40A in each of image A and B. (*Id.*) As the mark plate is moved to cover the information input space, the result is that "the multiplicity of marks 40A recorded on the mark plate 40 are moved to the positions corresponding to the multiplicity of lattice points (corresponding to virtual points) which are uniformly [sic] spaced in a lattice arrangement in the information input space." (*Id.*, 17:33-38.) This "correspondence between the three-dimensional coordinates of the lattice points in the information space and the positions thereof" on images A and B is stored in memory as the lattice point position information of each video camera. (*Id.*, 17:38-47.) FIG. 4 of *Harakawa* illustrates the movement of the mark plate within the information input space, and is reproduced below.

F I G. 4

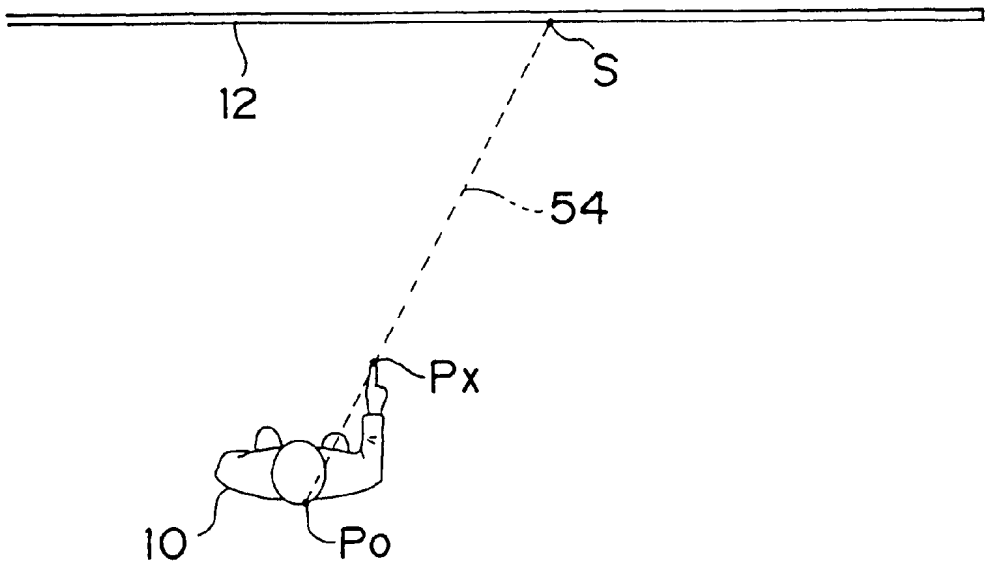


(*Id.*, FIG. 4.)

Harakawa discloses that after initialization processes are complete, "a full-length image of the information inputting person 10 [is] extracted from the images A and B." (*Id.*, 19:47-49.) Then, "the three-dimensional coordinates, (x_0, y_0, z_0) of a reference point P_0 of the information

inputting person 10" are determined using the captured images, where " the point . . . corresponding to the back of the information inputting person 10 or the like can be used as the reference point P_0." (*Id.*, 20:44-47.) "[W]hen the information inputting person 10 changes his/her attitude from an upright standing attitude . . . into an attitude of pointing with the hand to the display 12 . . . the determination that the information inputting person 10 is making a pointing motion is determined." (*Id.*, 21:4-9.) "[A] feature point P_X of the information inputting person 10 in the image A is extracted . . . and the position (X_A, Y_A) of the feature point P_X on the image A is calculated. The point corresponding to the fingertip pointing to the display 12 or the like can be used as the feature point P_X of the information inputting person 10." (*Id.*, 21:13-20.) The same feature point extraction is performed with image B. (*Id.*, 21:55-67.) "[T]he three-dimensional coordinates (X_X, Y_X, Z_X) of the feature point P_X are calculated on the basis of the three-dimensional coordinates of the common lattice points extracted from the images A and B." (*Id.*, 22:33-37.) "[B]ased on the three-dimensional coordinates of the reference point P_0 of the information inputting person . . . and the three-dimensional coordinates of the feature point P_X . . . the direction of an extended virtual line (see virtual line 54 in FIG. 11) connecting the reference point and the feature point is determined as the direction pointed to by the information inputting person 10, and the coordinates (plane coordinate) of the intersection point (see point S in FIG. 11) of the plane, including the display surface of the large-screen display 12, and the virtual line are calculated in order to determine the position pointed to by the information inputting person 10." (*Id.*, 22:38-50.) After calculation of the pointing direction and pointing coordinates, "whether or not the information inputting person 10 makes the click motion is determined," where "the click motion is defined as any motion of the hand of the information inputting person (for example, bending and turning a wrist, bending and extending a finger or the like.)" (*Id.*, 22:66-23:3.) Using these steps, a user may interact with a display (e.g., a map installed in a building) by pointing and clicking. (*Id.*, 24:1-22.) FIG. 11A of *Harakawa*, which illustrates an aerial view of the pointing direction determination, is reproduced below.

FIG. 11A



(*Id.*, FIG. 11A.)

Because *Harakawa* relates to optical sensing of human inputs using a personal computing device, *Harakawa* is in the same or similar technical field as *Liebermann* and the '079 patent, and a POSITA would have had reason to consider the teachings of *Harakawa* when implementing the *Liebermann* system. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 55-58.) To the extent *Harakawa* is not within the field of endeavor of the '079 patent, *Harakawa* is reasonably pertinent to problems associated with accurate determination of the orientation of objects in optical sensing systems, problems with which the inventor was involved. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 55-58.)

2. Claim 6

a. The method according to claim 1 further including determining the pointing direction of a finger in the work volume.

Liebermann in view of *Harakawa* discloses or suggests the limitations recited in claim 6. (Ex. PA-DEC, ¶¶ 155-158.) As discussed in Section V.A.5, *Liebermann* discloses or suggests these limitations recited in claim 6. (Section V.A.5.) To the extent "determining the pointing direction of a finger in the work volume" in claim 6 is read to require a vector determination, a POSITA would have found it obvious to modify *Liebermann* in view of *Harakawa*. (Ex. PA-DEC, ¶ 155.)

As discussed in Section V.A.7, *Liebermann* discloses determining a three-dimensional point on the signing user's hands. (Section V.A.7; Ex. PA-DEC, ¶ 156.) *Harakawa* discloses using the three-dimensional coordinates of a point on the user's hands and a reference point on the user's body in order to determine a pointing vector towards the display. (Section V.B.1; Ex. PA-DEC, ¶ 156.) In particular, "the three-dimensional coordinates, (x_0, y_0, z_0) of a reference point P_0 of the information inputting person 10" are determined, where " the point . . . corresponding to the back of the information inputting person 10 or the like can be used as the reference point P_0." (Ex. PA-2, 20:44-47.) In addition, "the three-dimensional coordinates (X_X, Y_X, Z_X) of the feature point P_X are calculated," where the feature point may be "[t]he point corresponding to the fingertip pointing to the display 12 or the like." (*Id.*, 21:13-20, 22:23-37.) "[B]ased on the three-dimensional coordinates of the reference point P_0 of the information inputting person . . . and the three-dimensional coordinates of the feature point P_X . . . ***the direction of an extended virtual line . . . connecting the reference point and the feature point is determined as the direction pointed to by the information inputting person 10***, and the coordinates (plane coordinate) of the intersection point . . . of the plane, including the display surface of the large-screen display 12, and the virtual line are calculated in order to determine the position pointed to by the information inputting person 10." (*Id.*, 22:38-50.) *Harakawa* discloses that these determinations allow the user to make a clicking motion, such as "bending and turning a wrist, bending and extending a finger or the like," in order to interactively communicate with a display. (*Id.*, 22:66-23:3.)

A POSITA would have found it obvious to modify the *Liebermann* method to calculate a pointing vector as in *Harakawa*. (Ex. PA-DEC, ¶ 157.) Because *Liebermann* already discloses or suggests determining three-dimensional coordinates of a hand (*see* Section V.A.7) *and* discloses capturing images of nearly the full signing user's body, a POSITA would have understood that the existing methods from *Liebermann* could be used to determine three-dimensional coordinates of both a reference point (such as the user's back) and a feature point (such as a fingertip on the user's

hand.) (Section V.A.7; Ex. PA-DEC, ¶ 157.) Then, the "direction of an extended virtual line" (i.e., a vector) could be determined using the three-dimensional coordinates of the reference and feature points. (Ex. PA-DEC, ¶ 157; Ex. PA-2, 22:38-50.) A POSITA would have been motivated to combine *Liebermann* and *Harakawa* for use in two potential circumstances. (Ex. PA-DEC, ¶ 157.) **First**, a POSITA would have understood that implementing the vector determination would be beneficial in distinguishing between similar signs. (*Id.*) As explained in Section V.A.5, various signs involve pointing in different directions, such that two signs may resemble each other in all ways except the direction of pointing. (Section V.A.5.) Thus, a POSITA would have understood that implementing a more precise vector determination in the *Liebermann* method would help quickly and accurately distinguish between similar looking signs that involve pointing in different directions. (Ex. PA-DEC, ¶ 157.) **Second**, a POSITA would have understood that the pointing vector determination and corresponding clicking motion of *Harakawa* would be beneficial in controlling the display of the *Liebermann* device. (*Id.*) *Liebermann* discloses that the visual display of the deaf user's device may include "***touchless function buttons***, system status indicators, alarms, a printed translation, and a playback of the image being recorded, as well as the signing images and text of the hearing person's responses." (Ex. PA-1, 6:31-36, FIG. 8 (disclosing a "function select tool bar").) A POSITA would have understood that a touchless method for clicking buttons or other areas on a display, such as the pointing vector and clicking method from *Harakawa*, would be ideal for implementing the touchless function buttons of *Liebermann*. (Ex. PA-DEC, ¶ 157.)

A POSITA would have had a reasonable expectation of success in implementing either of these modifications given that the modifications merely involve implementing the algorithm taught by *Harakawa* in *Liebermann*'s device according to well-known computer programming principles. (*Id.*, ¶ 158.) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving, such modifications because they would have involved a combination of known technologies (e.g., coordinate-based gesture detection systems (*Liebermann*)) according to known methods (e.g., methods of determining a gesture based on three-dimensional coordinates (*Harawaka*)) to yield the predictable result of a process as discussed above to produce accurate gesture detection for pointing signs, as well as touchless button functionality. (*Id.*) *See KSR* 550 U.S. at 416.

3. Claim 26

a. The method according to claim 21 further including determining the pointing direction of one of the user's fingers using the first and second cameras.

Liebermann in view of *Harakawa* discloses or suggests the limitations recited in claim 26. (Ex. PA-DEC, ¶ 159.) *Liebermann* in view of *Harakawa* discloses or suggests these limitations for similar reasons to those explained for claim 6. (Section V.B.2.) While claim 6 of the '079 patent recites "determining the pointing direction of ***a finger*** in the work volume," claim 26 recites "determining the pointing direction of ***one of the user's fingers using the first and second cameras***." (Ex. PAT-A, claims 6, 26.) The explanation for claim 6 describes how *Liebermann* in view of *Harakawa* discloses "determining the pointing direction of one of the user's fingers." (Section V.B.2.) However, *Liebermann* in view of *Harakawa* also discloses determining the pointing direction "using the first and second cameras." Section V.B.1 explains how *Harakawa* discloses using two video cameras to determine three-dimensional coordinates of points on the user, which a POSITA would have understood accomplishes similar three-dimensional position determination as the three-dimensional camera described in Section V.A.7. (Section V.B.1; Ex. PA-DEC, ¶ 159.) Furthermore, *Liebermann* discloses the feasibility of using multiple cameras in the cellular phone device. (Section V.A.18.) Thus, for the reasons discussed in Section V.A.7 and Section V.A.18, a POSITA would have found it obvious to implement the two-camera *Harakawa* method in a two-camera version of the *Liebermann* cellular phone in order to determine the pointing direction of one of the user's fingers. (Ex. PA-DEC, ¶ 159.)

C. SNQ3: *Liebermann* in view of *Mack*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* in view of *Mack* discloses or suggests the limitations of claims 7, 16, 17, 27, and 29 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-54, 59-61, 160-170.)

1. Overview of *Mack*

Mack discloses "a method and apparatus for navigating 3-D worlds" that uses stereo imaging to capture the 3-D information of a marker on the user hand." (Ex. PA-3, 2:19-22.) "The 3-D coordinates of the marker," which may include the hand marker but also facial expressions,

head movements, and eye movements, "are computed using 3-D camera geometry." (*Id.*, 2:22-26.) *Mack* discloses that "[t]he computer 110 is loaded with a 3-D processing program such as 3-D animation, game, education, and visualization." (*Id.*, 2:41-43.) The computer may connect to "one or more input/output (I/O) devices such as display monitor 120, keyboard 130, mouse, and tablet digitizer," as well as "input unit 150 for receiving 3-D information." (*Id.*, 2:45-50.) "The display monitor 120 displays the 3-D graphic or image data as processed by the computer 110," while "[t]he input unit 150 provides a housing for the 3-D input system which provides a work area for the user hand 160." (*Id.*, 2:51-59.) The input unit 150 may include "a stereo camera system to determine the 3-D coordinates of a marker manipulated by the user. (*Id.*, 2:58-62.) In addition, the marker, which "can be conveniently worn on the user's finger," is illuminated by a light source and imaged by the stereo cameras. (*Id.*, 2:67-3:2.) The two cameras can be any cameras "that can capture images of a moving object in real-time," but they must be positioned so that the "stereo imaging geometry allows the computation of the 3-D coordinates of the object." (*Id.*, 3:38-49.) *Mack*'s FIG. 1 is reproduced below and illustrates these components.

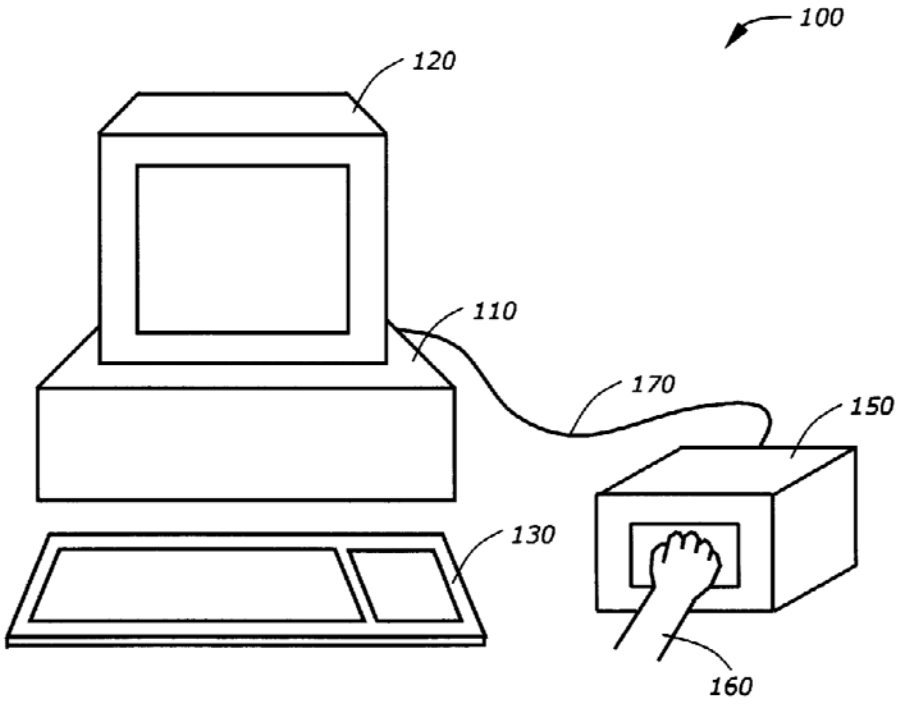


FIG. 1

(*Id.*, FIG. 1.)

Mack further discloses that "[t]he marker 240 is any convenient object that is used to facilitate the detection of the movement of the user's hand or finger." (*Id.*, 3:64-66.) For example, the marker may be "a specially designed object that can be worn at the tip of the user's finger." (*Id.*, 3:66-4:1.) The marker ideally has unique features, including color, shape, or type of material, "so that the processing of the images captured by the two cameras 220 and 230 can be performed quickly to identify the marker 240." (*Id.*, 4:1-5.) Multiple markers can even be used, so that each marker has "different unique features to facilitate the detection." (*Id.*, 6:53-59.) "[T]he 3-D coordinates of the marker 240 are determined by solving equations of the lines 245 and 247." (*Id.*, 4:9-12.) Various arrangements of finger movements and marker placements may be used to create different 3-D input patterns, which "may correspond to a specific command or may correspond to the exact 3-D movement that the user wants to navigate in the 3-D world" as displayed on the 3-D display. (*Id.*, 6:38-67.) FIG. 2 of *Mack* illustrates the use of the marker and is reproduced below.

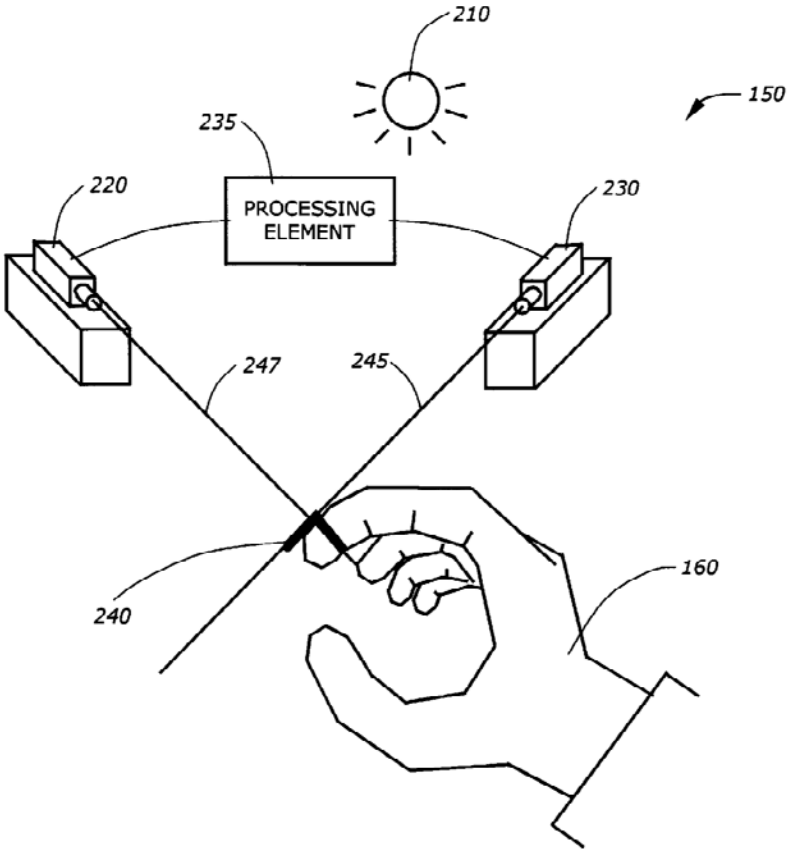


FIG. 2

(*Id.*, FIG. 2.)

Because *Mack* relates to display and enhanced detection techniques for use with optical sensing of human inputs, *Mack* is in the same or similar technical field as *Liebermann* and the '079 patent, and a POSITA would have had reason to consider the teachings of *Mack* when implementing the *Liebermann* system. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 59-61.) To the extent *Mack* is not within the field of endeavor of the '079 patent, *Mack* is reasonably pertinent to problems associated with implementing optical sensing and image analysis systems and displaying related information, as well as problems associated with enhanced detection of human inputs using targets, both problems with which the inventor was involved. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 59-61.)

2. Claim 7

a. The method according to claim 1 further including providing a target positioned on

a user that is viewable in the work volume.

Liebermann in view of *Mack* discloses or suggests the limitations recited in claim 7. (Ex. PA-DEC, ¶¶ 161-164.) As discussed in Section V.A.6, *Liebermann* discloses or suggests these limitations. (Section V.A.6.) To the extent that "providing a target positioned on a user" in claim 7 is read to require a smaller finger target, and since *Liebermann* does not expressly disclose such features, a POSITA would have found it obvious to modify the method in *Liebermann* in view of *Mack*. (Ex. PA-DEC, ¶ 161.)

Mack discloses a marker that is "any convenient object that is used to facilitate the detection of the movement of the user's hand or finger," such as "***a specially designed object that can be worn at the tip of the user's finger***." (Ex. PA-3, 3:64-4:1.) The marker ideally has unique features, including color, shape, or type of material, "so that the processing of the images captured by the two cameras 220 and 230 can be performed quickly to identify the marker 240." (*Id.*, 4:1-5.) Multiple markers can even be used, so that each marker has "different unique features to facilitate the detection." (*Id.*, 6:53-59.) A POSITA would have understood that this *marker* functions as a small finger *target* positioned on a user's finger, which enhances a camera's ability to detect the finger as gestures are made. (Ex. PA-DEC, ¶ 162.) Because *Liebermann* discloses a special glove with similar detection features as the target/marker in *Mack*, a POSITA would have been motivated to combine *Liebermann* with *Mack* to implement a smaller finger target with the same unique features as those in *Liebermann*'s glove. (Section V.A.6; Ex. PA-DEC, ¶ 162.)

A POSITA would have understood that this combination would be beneficial for two reasons. (Ex. PA-DEC, ¶ 163.) **First**, a POSITA would have recognized that such a combination would be beneficial in aiding detection of signs where dynamic articulations and free range of motion of the hand are important. (*Id.*) *Liebermann* discloses that ASL requires "simultaneous, multiple, dynamic articulations," combining information about the handshape, motion, and spatial location of the hands, which a POSITA would have understood requires a flexible range of motion in the signing user's hands. (Ex. PA-1, 10:59-64; Ex. PA-DEC, ¶ 163.) A POSITA would have recognized that the smaller target from *Mack* would be less bulky than a glove from *Liebermann* and would enable the signing user to gesture more easily. (Ex. PA-DEC, ¶ 163.) **Second**, a POSITA would have understood that the target from *Mack* would be ideally suited for use with the three-dimensional detection of *Liebermann*. (*Id.*) As discussed in Section V.A.7, *Liebermann*

discloses or suggests using a three-dimensional camera with the cellular phone, and as discussed in Section V.A.18, *Liebermann* discloses or suggests using multiple cameras with the cellular phone as well. (Section V.A.7.) It was well known at the time of the invention that multiple cameras could be arranged in stereo to accomplish the same goals as a single three-dimensional camera. (Ex. PA-10, 1:25-42 (describing numerous methods and mechanisms in the prior art that "employ[] two independent cameras" in a stereo arrangement in order to gather three-dimensional video), Abstract (disclosing similar three-dimensional video gathering using a single three-dimensional camera).) Similarly, *Mack* discloses that the marker/target is designed for detection by stereo cameras so that the marker/target can convey 3-D input data to the disclosed device. (Ex. PA-3, 3:64-4:5, 6:38-67.) Thus, a POSITA would have understood that a smaller finger target as in *Mack* would be ideally suited for detection of signs in *Liebermann* when camera(s) are either three-dimensional or arranged in a stereo arrangement on the cellular device. (Ex. PA-DEC, ¶ 163.)

A POSITA would have had a reasonable expectation of success in implementing this modification because detection of targets with three-dimensional or stereo cameras was known. (*Id.*, ¶ 164.) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving, such a modification because they would have involved applying known technologies (e.g., known gesture and target detection technology (*Liebermann*)) and materials (e.g., finger targets to aid in gesture detection (*Mack*)) according to known methods (e.g., known three-dimensional and stereo camera techniques) to yield the predictable result of a small target implemented in a sign language detection system as discussed above. (*Id.*) *See KSR* 550 U.S. at 416.

3. Claim 16

a. The computer apparatus of claim 12 wherein the display includes a three-dimensional display.

Liebermann in view of *Mack* discloses or suggests the limitations recited in claim 16. (Ex. PA-DEC, ¶¶ 165-167.) *Liebermann* does not disclose that "the display includes a three-dimensional display." However, *Mack* discloses that "[t]he display monitor 120 displays the 3-D graphic or image data as processed by the computer 110," and "provides a means for user to navigate the 3-D world as processed by the computer." (Ex. PA-3, 2:25-26, 2:51-52.) "The

computer 110 is loaded with a 3-D processing program such as 3-D animation, game, education, and visualization" and may be "based on a high performance microprocessor, such as any type of Intel® microprocessor architecture." (*Id.*, 2:41-45.) *Mack* notes that such "[t]hree-dimensional (3-D) graphic and imaging systems" were well-known and popular, as were "[h]igh performance processors with 3-D capabilities [that had] been developed for 3-D applications such as animation, visualization, games, and education." (*Id.*, 1:11-15.) *Mack* further discloses that the display monitor that "displays the 3-D graphic or image data" may be "any monitor, including cathode ray tube (CRT), a flat panel display, etc." (*Id.*, 2:51-54.) By using these known 3-D graphics, processor, and display components—all "commercially off-the-shelf hardware"—*Mack* discloses a method "for navigation in 3-D world" by which a three-dimensional display may be implemented to provide a "simple and efficient 3-D vision system." (*Id.*, 6:63-67; Ex. PA-DEC, ¶ 165.)

Liebermann discloses that when a hearing person responds to the signing user's communication, the speech is translated back to signs. (Ex. PA-1, 5:14-34.) "The sign images then appear on the screen of a monitor viewed by the deaf person, resulting in a continuous dynamic set of animated sign language motions which portray the content of the spoken language uttered as speech by the normally hearing person." (*Id.*, 5:30-34.) A POSITA would have been motivated to combine the screen animation of *Liebermann* with the three-dimensional display of *Mack* in order to enhance both the user experience and the amount of information that may be conveyed through animation. (Ex. PA-DEC, ¶ 166.) *Liebermann* discloses that ASL incorporates "information about the handshape (Stokoe's dez), the motion (Stokoe's sig) and the spatial location of the hands relative to the rest of the body (Stokoe's tab.)" (Ex. PA-1, 10:60-64.) A POSITA would have understood that because the motion (Stokoe's sig) of a sign can involve a hand moving in the depth direction (i.e., from the signing user towards the cellular phone display), the ability to convey depth through a three-dimensional display would be beneficial. (Ex. PA-DEC, ¶ 166.) Furthermore, a POSITA would have understood that the *Mack* 3-D detection technology and three-dimensional display could be combined with *Liebermann*'s disclosure of touchless function buttons to enable a signing user to interact with the three-dimensional display. (*Id.*; Ex. PA-1, 6:31-36.) *Mack* discloses using 3-D inputs from the hands to signal commands to the three-dimensional display, which a POSITA would have recognized is an ideal method to incorporate into the cellular phone of *Liebermann* to enable use of the touchless function buttons. (Ex. PA-3, 6:38-67; Ex. PA-DEC, ¶ 166.)

A POSITA would have had a reasonable expectation of success in implementing this modification because, as described in the preceding paragraph, the modification involves implementing *Mack*'s three-dimensional display, which uses known, commercially available hardware, processor, and 3-D graphics components, in the *Liebermann* cellular phone, which a POSITA would have understood contains similar hardware and processor components. (Ex. PA-DEC, ¶ 167.) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving, such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann*)) and materials (e.g., known three-dimensional displays (*Mack*)) according to known methods (e.g., known three-dimensional gesture detection techniques) to yield the predictable result of a three-dimensional display implemented within a sign language detection and communication system. (*Id.*) *See KSR* 550 U.S. at 416.

4. Claim 17

a. The computer apparatus of claim 11 further including a target that is viewable by the camera when in the work volume.

Liebermann in view of *Mack* discloses or suggests the limitations recited in claim 17. (Ex. PA-DEC, ¶ 168.) *Liebermann* in view of *Mack* discloses or suggests these limitations for the same reasons as those explained for claim 7. (Section V.C.2.) While claim 7 recites that the target is "viewable in the work volume," claim 17 recites that the target is "viewable by the camera when in the work volume." (Ex. PAT-A, claims 7, 17.) However, a POSITA would have understood that if *Liebermann* in view of *Mack* discloses a target on a user that is viewable in the work volume, it also discloses a target on a user that is viewable by the camera when in the work volume, as the work volume is the area where gestures are performed within the camera's view. (Ex. PA-DEC, ¶ 168.)

5. Claim 27

a. The method according to claim 21 further including providing a target positioned on the user that is viewable by the camera.

Liebermann in view of *Mack* discloses or suggests the limitations recited in claim 27. (Ex. PA-DEC, ¶ 169.) *Liebermann* in view of *Mack* discloses or suggests these limitations for the same reasons as those explained for claim 7. (Section V.C.2.) While claim 7 recites that the target is "viewable in the work volume," claim 27 recites that the target is "viewable by the camera." (Ex. PAT-A, claims 7, 27.) However, a POSITA would have understood that if *Liebermann* in view of *Mack* discloses a target on a user that is viewable in the work volume, it also discloses a target on a user that is viewable by the camera, as the work volume is the area where gestures are performed within the camera's view. (Ex. PA-DEC, ¶ 169.)

6. Claim 29

a. The method according to claim 21 further including a three-dimensional display viewable by the user.

Liebermann in view of *Mack* discloses or suggests the limitations recited in claim 29. (Ex. PA-DEC, ¶ 170.) *Liebermann* in view of *Mack* discloses or suggests these limitations for the same reason as those explained for claim 16. (Section V.C.3.) While claim 16 does not recite that the three-dimensional display is "viewable by the user," the explanation for claim 16 is sufficient to show how *Liebermann* in view of *Mack* discloses this additional limitation because the display is always operated within the user's view. (Ex. PA-DEC, ¶ 170.)

D. SNQ4: *Liebermann* in view of *Bushnag*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* in view of *Bushnag* discloses or suggests the limitations of claim 10 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-54, 62-64, 171-175.)

1. Overview of *Bushnag*

Bushnag discloses "[a]n eye-controlled command system (10) using the human eye to control the operation of a selected device or devices." (Ex. PA-4, 31:2-4.) The system "includes a digital camera (12) to follow the movement of one eye (42), and the opening and closing of that eyelid," as well as "[a]nother digital camera (14) . . . for monitoring the opening and closing of the other eye (42)." (*Id.*, 31:4-9.) A scanning device (24) enables the digitizer screen (20) to display the "images detected by each camera (12, 14)." (*Id.*, 31:10-12.) "The scanning device (24)

delivers output to a control unit (26), that output including the color within each pixel (22) of the detected images." (*Id.*, 31:12-15.) Using this output, the control unit (26) is able to "compare[] the location of the eye (42) with respect to a command template (16)," such that a user may perform an initiating sequence with their eyes (42) in order to signal a command to the device. (*Id.*, 31:15-21.)

In a relevant embodiment, as shown in FIG. 9 (reproduced below), "a conventional laptop computer 70, or notebook computer, is provided with two digital cameras 12, 14, one being disposed at either corner in the upper region of the screen area 20." (*Id.*, 22:15-20.) In addition, "[a] microphone 36 and a speaker 72 are provided for audible communication between the control system 10 and the user." (*Id.*, 22:20-23.) *Bushnag* discloses that "[t]his type of system 10 is particularly practical" for "allow[ing] a multitude of persons in distant areas to simultaneously communicate both audibly and visually . . . [from] remote locations." (*Id.*, 22:23-30.) While the FIG. 9 embodiment discloses a laptop, *Bushnag* notes that the system may incorporate "conventional equipment such as cellular telephone technology and other internal computer components." (*Id.*, 22:30-23:2.)

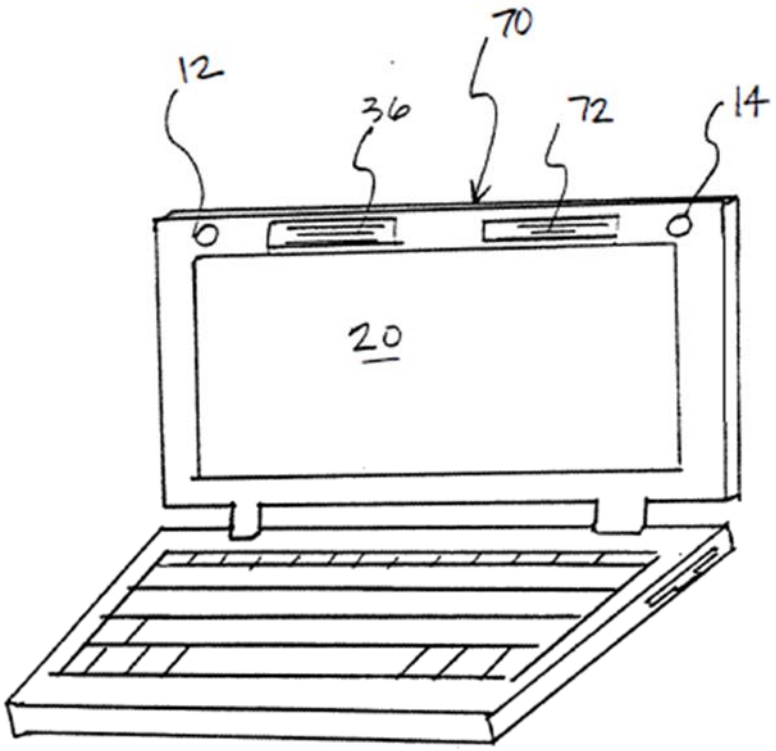


FIG. 9

(*Id.*, FIG. 9.)

Because *Bushnag* relates to optical sensing of human inputs using a personal computing device, *Bushnag* is in the same or similar technical field as *Liebermann* and the '079 patent, and a POSITA would have had reason to consider the teachings of *Bushnag* when implementing the *Liebermann* system. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 62-64.) To the extent *Bushnag* is not within the field of endeavor of the '079 patent, *Bushnag* is reasonably pertinent to problems associated with personal computing device configurations for optical sensing systems, problems with which the inventor was involved. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 62-64.)

2. Claim 10

a. The method according to claim 9 the camera, the light source and the keypad form part of a laptop computer.

Liebermann in view of *Bushnag* discloses or suggests the limitations recited in claim 10. (Ex. PA-DEC, ¶¶ 172-175.) As discussed in Section V.A.2, *Liebermann* discloses a camera and a keypad, and a POSITA would have found it obvious to implement a light source, but *Liebermann* does not disclose that these components form part of a laptop computer. (Section V.A.2.) *Bushnag* discloses that a gesture detection system (specifically, for eye gestures) is implemented in a laptop embodiment with cameras 12 and 14, display 20, and a keyboard as shown in FIG. 9. (Ex. PA-4, FIG. 9, 22:15-20.) A POSITA would have been motivated to combine the *Liebermann* cellular phone device teachings with the *Bushnag* laptop teachings and suggestions in order to consider and configure a laptop version of the *Liebermann* device. (Ex. PA-DEC, ¶ 172.) A POSITA would have had reasons to consider *Bushnag* and its suggestions and teachings when contemplating the design and implementation of *Liebermann*'s gesture based processes, especially in light of *Liebermann* disclosures of a desktop computer embodiment (FIG. 5*a*) having very similar functionality to the cellular phone device, where "the deaf person's station comprises a personal computer 30 including the monitor 32 and a video camera 34." (Ex. PA-1, 5:53-55, FIG. 5*a*.) Thus, a POSITA would have understood that a portable laptop device of intermediate size (between that of a cellular phone and desktop computer) would be advantageous. (Ex. PA-DEC, ¶ 172.) Furthermore, *Bushnag* discloses that the laptop embodiment is advantageous for communication systems, which a POSITA would have recognized would be ideal for the *Liebermann* communication and gesture detection system. (*Id.*; Ex. PA-4, 22:30-23:2.)

A POSITA would have had a reasonable expectation of success in implementing this modification because laptop-based gesture detection systems were known and because *Liebermann* describes implementations involving various computer configurations (e.g., kiosk, set-top box, desktop, cellular phone (Ex. PA-1, FIGS. 5A-5C, 6)), which provided guidance to a POSITA that variations of similar systems/devices were capable of operating successfully. (Ex. PA-DEC, ¶ 173.) Moreover, a POSITA would have had the skill to implement, and expectation of success in achieving, such a modification because it would have involved applying known technologies (e.g., known gesture detection technology (*Liebermann*)) and materials (e.g., known laptop embodiments for gesture recognition processing (*Bushnag*)) according to known methods (e.g., known gesture recognition techniques) to yield the predictable result of a laptop-based sign language detection device. (*Id.*) *See KSR* 550 U.S. at 416.

A POSITA also would have understood that, as required by independent claim limitation 1.b. and therefore dependent claim 10, the work volume remains above the light source. (Ex. PA-DEC, ¶ 174.) As discussed in Section V.A.2.b, a POSITA would have found it obvious to modify the cellular phone to include a light source comprising a series of lights on each side of the display. (Section V.A.2.b.) *Liebermann* discloses that the cameras of the sign detection method capture portions of the head, torso, arms, and legs (i.e., most of the body), so a POSITA would have understood that the device may be placed in a stable position so that it captures a *standing* user. (Ex. PA-1, 7:44-9:27; Ex. PA-DEC, ¶ 174.) Thus, a POSITA would have recognized that when a laptop embodiment is placed in a stable position and the camera is oriented so as to capture the majority of the signing user's body, the work volume still extends *above* the level of the light source because the user would be standing above the stable location of the device (e.g., table or other surface.) (Ex. PA-DEC, ¶ 174.)

A POSITA would have also understood that, as required by claim 9 and therefore dependent claim 10, the camera and light source remain "positioned in fixed relation relative to a keypad." (Ex. PA-DEC, ¶ 175.) The '079 patent suggests that "fixed" elements are elements that do not rotate with respect to each other and have "fixed fields of view." (Ex. PAT-A, 9:41-48.) Thus, elements that can be repositioned may still be "fixed" according to the '079 patent, as long as there is not continuous movement. (*Id.*; Ex. PA-DEC, ¶ 175.) Thus, a POSITA would have understood that the camera and light source (incorporated on the sides of the display) in the upper portion of the *Liebermann-Bushnag* laptop could still be fixed relative to the keypad in the base portion the laptop, even with the presence of a typical laptop "hinge" in between the two panes. (Ex. PA-DEC, ¶ 175.) A POSITA would have recognized that when the laptop is opened, the panes remain fixed relative to each other until repositioned, consistent with the understanding of "fixed" in the '079 patent. (*Id.*)

E. SNQ5: *Liebermann* in view of *Meins*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* in view of *Meins* discloses or suggests the limitations of claim 13 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-54, 65-68, 176-180.)

1. Overview of *Meins*

Meins "relates generally to portable radiotelephones for use in a wireless communication system." (Ex. PA-5, 1:13-16.) In particular, *Meins* discloses that "the personal communicator 100 has two main portions, a body portion 101 and a flip element 121" which are "connected by a hinge 131." (*Id.*, 3:42-45.) "A keypad 103 is provided on the body portion 101." (*Id.*, 3:53.) "When the flip element 121 is open as shown in FIG. 1 [reproduced below], a built-in display 123 is visible to a user of the personal communicator 100." (*Id.*, 4:5-7.) "The display 123 advantageously provides various types of visual information to the user of the personal communicator 100, such as alphanumeric text, or graphic or video images." (*Id.*, 4:9-12.)

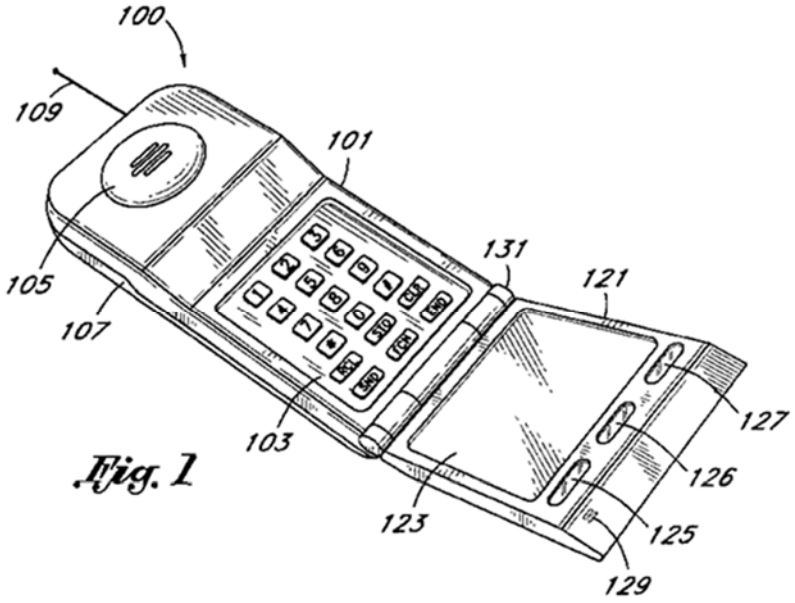
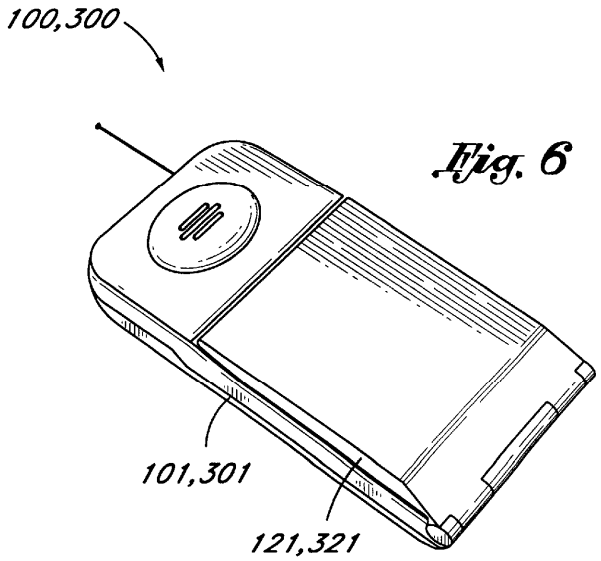


Fig. 1

(*Id.*, FIG. 1.)

Meins shows in FIG. 6, reproduced below, "the configuration of . . . the personal communicator[] 100 . . . when the flip element 121 . . . is folded inward to meet with the body portion 101." (*Id.*, 9:50-53.) *Meins* discloses that this method of closing the personal communicator allows for transformation to "a compact state for easy storage" and "advantageously serves to protect the display 123." (*Id.*, 9:53-56.) In addition, "[t]he display 123 is maintained in an off state when the flip element 121 is closed, to conserve power." (*Id.*, 6:31-33.)



(*Id.*, FIG. 6.)

Meins discloses that compared to prior art flip phone devices, which featured the display in the body portion and therefore could only present "a small amount of information . . . at a time," the disclosed personal communicator has a "larger visual display with enhanced features, and the capability to send, receive, and store non-voice information." (*Id.*, 1:52-2:3.)

Because *Meins* relates to configurations for personal computing devices, *Meins* is in the same or similar technical field as *Liebermann* and the '079 patent, and a POSITA would have had reason to consider the teachings of *Meins* when implementing the *Liebermann* system. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 65-68.) To the extent *Meins* is not within the field of endeavor of the '079 patent, *Meins* is reasonably pertinent to problems associated with personal computing device configurations and display techniques for computing systems, problems with which the inventor was involved. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 65-68.)

2. Claim 13

a. The computer apparatus of claim 12 wherein the display is pivotable relative to the keyboard.

Liebermann in view of *Meins* discloses or suggests the limitations recited in claim 13. (Ex. PA-DEC, ¶¶ 177-180.) *Liebermann* discloses that the FIG. 6 embodiment is a cellular phone, but does not disclose that the cellular phone display is pivotable relative to the keyboard (keypad). (Ex. PA-1, FIG. 6, 4:20-21; Ex. PA-DEC, ¶ 177.) *Meins* discloses a "personal communicator 100

[which] has two main portions, a body portion 101 and a flip element 121" that are "connected by a hinge 131." (Ex. PA-5, 3:42-45.) This personal communicator, which is a cellular phone, has a "keypad 103 [which] is provided on the body portion 101." (*Id.*, 3:53.) "When the flip element 121 is open . . . , a built-in display 123 is visible to a user of the personal communicator 100." (*Id.*, 4:5-7.) *Meins* further discloses that "when the flip element 121 . . . is folded inward to meet with the body portion 101," the personal communicator allows for transformation to "a compact state for easy storage" and "advantageously serves to protect the display 123." (*Id.*, 9:50-56.) In addition, "[t]he display 123 is maintained in an off state when the flip element 121 is closed, to conserve power." (*Id.*, 6:31-33.) *Meins* discloses that compared to prior art flip phone devices, which featured the display in the body portion and therefore could only present "a small amount of information . . . at a time," the disclosed personal communicator has a "larger visual display with enhanced features, and the capability to send, receive, and store non-voice information." (*Id.*, 1:52-2:3.)

A POSITA would have found it obvious to modify the *Liebermann* cellular phone so that it has a pivotable structure (e.g., a flip structure or similar types of pivotable configurations, similar to the *Meins* personal communicator). (Ex. PA-DEC, ¶ 178.) In particular, a POSITA would have been motivated to make such a modification in light of the benefits disclosed in *Meins* regarding compact storage, power conservation, and larger display capabilities. (*Id.*) A POSITA would have understood that the *Liebermann* cellular phone—which would have power needs in order to perform the required gesture recognition processing and video display features—would benefit from the ability to close and turn off the display when not in use so that power can be conserved. (*Id.*) Furthermore, a POSITA would have recognized that a user would find the compact, portable nature of a flip phone to be desirable in order to more easily transport the device. (*Id.*) Because the *Liebermann* cellular phone display provides text, animation, touchless function buttons, and video playback, a POSITA would have also understood how a flip phone design could advantageously allow for integration of a larger display. (*Id.*)

Configuring *Liebermann*'s cellular phone to have a flip phone configuration similar to that described by *Meins* would have resulted in the phone's display being "pivotable" relative to the keyboard of the device. (*Id.*, ¶ 179.) Indeed, a flip phone device with similar hinge arrangements is consistent with how the '079 patent describes such "pivotable" features. (Ex. PAT-A, FIGS. 1-3 (displaying a portable device with hinged upper and base portions); Ex. PA-DEC, ¶ 179.) A

POSITA would have understood that the modified cellular phone device could be opened to the full extension of the hinge and placed in a "stable position" as contemplated by *Liebermann*, so that the cellular phone device still provides similar functionality like the device in FIG. 6. (Ex. PA-DEC, ¶ 179; Ex. PA-1, FIG. 6, 6:2-6.) Thus, even with the addition of a hinge that allows the display to be pivotable relative to the keyboard, a POSITA would have understood that the work volume associated with such a modified device would have still been arranged like that recited in claims 11 and 12—generally above the light source (incorporated as a modification on each side of the display), but also in front of the display and above the keyboard. (Ex. PA-DEC, ¶ 179; Sections V.A.9.b, V.A.10.) This is because the hinged device would have had a similar configuration/shape as the device discussed with respect to claims 11.b and 12. (Ex. PA-DEC, ¶ 179; Sections V.A.9.b, V.A.10 (applicable and incorporated here).) Thus, *Liebermann* in view of *Meins* discloses or suggests a "display . . . pivotable relative to the keyboard."

A POSITA would have had the skills and motivation to implement such a modification, and would have had a reasonable expectation of success in achieving it, because it would have involved applying known technologies (e.g., known gesture detection cellular phone technology (*Liebermann*) and pivotable configurations for cellular phones (*Meins*)) according to known methods (e.g., known cellular phone-based gesture recognition techniques and cellular phone design techniques) to yield the predictable result of providing a flip display-based cellular phone that maintained *Liebermann*'s sign language detection functionalities. (Ex. PA-DEC, ¶ 180.) *See KSR* 550 U.S. at 416.

F. SNQ6: *Liebermann* in view of *Auten*

As explained below and in the attached declaration of Dr. Abowd (Ex. PA-DEC), *Liebermann* in view of *Auten* discloses or suggests the limitations of claims 2, 3, 14, 15, 22, and 23 of the '079 patent. (Ex. PA-DEC, ¶¶ 51-54, 69-70, 181-189.)

1. Overview of *Auten*

Auten discloses a cellular telephone with "an aperture or lens, 42, which is sufficiently transparent or translucent to allow light generated from a light source contained inside the housing of the cellular telephone to pass through and provide illumination. The lens may be produced from glass or plastic and may be clear or colored. The cellular telephone may further include a switch, 44, in electrical communication with the electrical circuit which includes the light source, to permit

the light source to be switched on and off." (Ex. PA-6, 6:14-23.) The light source incorporated into the cellular phone may "include a light bulb, including but not limited to conventional incandescent bulbs comprising a wire filament including krypton, tungsten, mercury vapor, hollow cathode, argon, tridium lightbulbs; a light emitting diode (LED); neon lightbulbs; and [fluorescent] bulbs." (*Id.*, 4:66-5:3, 6:55-57.) In particular, "[t]he source should be of sufficient lumens to provide . . . sufficient illumination to allow a user of the communications device to illuminate at least a portion of the area surrounding the device." (*Id.*, 5:3-7.) FIG. 2a below displays the *Auten* cellular phone with light 42.

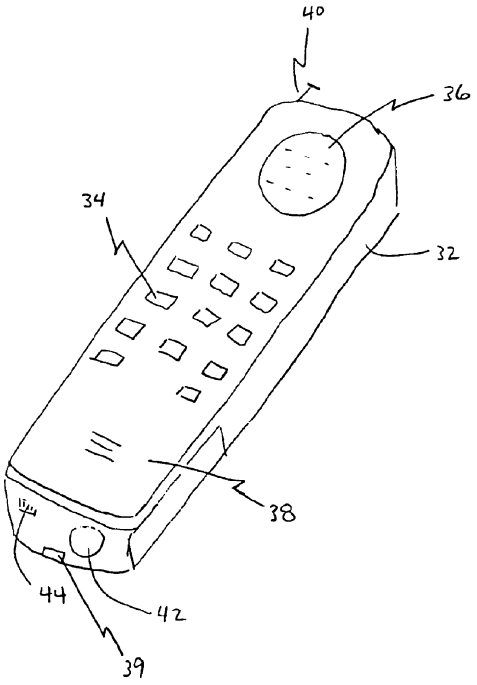


Figure 2a

(*Id.*, FIG. 2a.)

Because *Auten* relates to illuminating the area surrounding a personal computing device in order to view objects, *Auten* is in the same or similar technical field as *Liebermann* and the '079 patent, and a POSITA would have had reason to consider the teachings of *Auten* when implementing the *Liebermann* system. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 69-70.) To the extent *Auten* is not within the field of endeavor of the '079 patent, *Auten* is reasonably pertinent to problems associated with effectively illuminating the area surrounding personal computing

devices, problems with which the inventor was involved. (*Supra* Sections III.A, V.A.1; Ex. PA-DEC, ¶¶ 69-70.)

2. Claim 2

a. The method according to claim 1 wherein the light source includes a light emitting diode.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 2. (Ex. PA-DEC, ¶¶ 182-184.) As discussed in Section V.A.2.b, a POSITA would have been motivated to modify the *Liebermann* cellular phone to have a separate light source comprising lights on each side of the display, as depicted in the related *Liebermann* kiosk. (Section V.A.2.b.) However, *Liebermann* does not disclose or suggest that this separate light source "includes a light emitting diode." A POSITA would have found it obvious in view of *Auten* to implement the light source so that it "includes a light emitting diode." (Ex. PA-DEC, ¶ 182.)

Auten discloses that an incorporated light source in the cellular phone may "include . . . a light emitting diode (LED)." (Ex. PA-6, 4:66-5:3, 6:55-57.) A POSITA would have been motivated to modify the *Liebermann* cellular phone to incorporate the *Auten* LED light source in the *Liebermann* cellular phone. (Ex. PA-DEC, ¶ 183.) In particular, a POSITA would have recognized that the incorporated light source of the modified *Liebermann* cellular phone (*see* Section V.A.2.b) desirably serves the same function as the incorporated light source of the *Liebermann* kiosk—providing adequate lighting to the work volume where gestures are performed—but may have different hardware needs because of the structural differences between a cellular phone and a larger public telephone kiosk. (Ex. PA-DEC, ¶ 183; *see also* Section V.A.2.b.) Therefore, a POSITA would have recognized the need to consider specific types of lights (rather than the kiosk "lamps") that would be well-suited to cellular phones but would also provide adequate lighting to the area around the device. (Ex. PA-DEC, ¶ 183.) A POSITA would have understood that the *Auten* LED would be ideal because *Auten* discloses a cellular phone with an incorporated LED that provides "sufficient illumination to allow a user of the communications device to illuminate at least a portion of the area surrounding the device"—that is, the area roughly corresponding to the work volume in the *Liebermann* device. (Ex. PA-6, 5:3-7; *see also* Section V.A.2.b.) Thus, a POSITA would have been motivated to implement the *Auten* LED as the chosen light source in the modified *Liebermann* cellular phone, with multiple LED lights positioned on

each side of the display (collectively comprising a "light source") as described in Section V.A.2.b. (Ex. PA-DEC, ¶ 183; Section V.A.2.b.)

A POSITA would have had a reasonable expectation of success in implementing this modification because the combination of LEDs and cellular phone was well known. (Ex. PA-DEC, ¶ 184.) Additionally, a POSITA would have had the skill to implement, and expectation of success in achieving, such a modification because it would have involved a combination of known technologies (e.g., cellular phone-based gesture detection technology (*Liebermann*)) according to known methods (e.g., using an LED to light the area around the cellular phone (*Auten*)) to yield the predictable result of a cellular phone as discussed above that uses incorporated LEDs to adequately light the work volume of the cellular phone. (*Id.*) *See KSR* 550 U.S. at 416.

3. Claim 3

a. The method according to claim 1 wherein the light source includes a plurality of light emitting diodes.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 3. (Ex. PA-DEC, ¶ 185.) *Liebermann* in view of *Auten* discloses or suggests these limitations for the reasons explained for claim 2, which explains how multiple (a plurality of) light emitting diodes may be incorporated in the *Liebermann-Auten* cellular phone. (Section V.F.2.)

4. Claim 14

a. The computer apparatus of claim 11 wherein the light source includes a light emitting diode.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 14. (Ex. PA-DEC, ¶ 186.) *Liebermann* in view of *Auten* discloses or suggests these limitations for the reasons explained for claim 2. (Section V.F.2.)

5. Claim 15

a. The computer apparatus of claim 11 wherein the light source includes a plurality of light emitting diodes.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 15. (Ex. PA-DEC, ¶ 187.) *Liebermann* in view of *Auten* discloses or suggests these limitations for the reasons explained for claim 2, which explains how multiple (a plurality of) light emitting diodes may be incorporated in the *Liebermann-Auten* cellular phone. (Section V.F.2.)

6. Claim 22

a. The method according to claim 21 wherein the light source includes a light emitting diode.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 22. (Ex. PA-DEC, ¶ 188.) *Liebermann* in view of *Auten* discloses or suggests these limitations for the reasons explained for claim 2. (Section V.F.2.)

7. Claim 23

a. The method according to claim 21 wherein the light source includes a plurality of light emitting diodes.

Liebermann in view of *Auten* discloses or suggests the limitations recited in claim 23. (Ex. PA-DEC, ¶ 189.) *Liebermann* in view of *Auten* discloses or suggests these limitations for the reasons explained for claim 2, which explains how multiple (a plurality of) light emitting diodes may be incorporated in the *Liebermann-Auten* cellular phone. (Section V.F.2.)

VI. Detailed Explanation of the Pertinence and Manner of Applying the Prior Art to the Claims

A. Bases for Proposed Rejections of the Claims

The following is a quotation of pre-AIA 35 U.S.C. § 102 that forms the basis for all of the identified prior art:

> A person shall be entitled to a patent unless...
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States … .

The following is a quotation of pre-AIA 35 U.S.C. § 103(a) that forms the basis of all of the following obviousness rejections:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negative by the manner in which the invention was made.

The question under 35 U.S.C. § 103 is whether the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention. In *KSR International Co. v. Teleflex Inc*., 550 U.S. 398 (2007), the Court mandated that an obviousness analysis allow for "common sense" and "ordinary creativity," while at the same time not requiring "precise teachings directed to the specific subject matter of the challenged claim[s]." *KSR Int'l Co.*, 550 U.S. at 418, 420-421. According to the Court, "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* at 416. In particular, the Court emphasized "the need for caution in granting a patent based on the combination of elements found in the prior art." *Id.* at 401. The Court also stated that "when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* at 417.

The Office has provided further guidance regarding the application of *KSR* to obviousness questions before the Office.

> If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

MPEP § 2141(1) (quoting *KSR* at 417.)

The MPEP identifies many exemplary rationales from *KSR* that may support a conclusion of obviousness. Some examples that may apply to this reexamination include:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices in the same way;
- Applying a known technique to improve devices in the same way;

- Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success ("obvious to try")

MPEP § 2141(III).

In addition, the Office has published *Post-KSR* Examination Guideline Updates. *See* Fed. Reg. Vol. 75, 53464 (the "Guideline Updates".) The Guideline Updates discuss developments after *KSR* and provide teaching points from recent Federal Circuit decisions on obviousness. Some examples are listed below:

> A claimed invention is likely to be obvious if it is a combination of known prior art elements that would reasonably have been expected to maintain their respective properties or functions after they have been combined.

Id. at 53646.

> A combination of known elements would have been prima facie obvious if an ordinary skilled artisan would have recognized an apparent reason to combine those elements and would have known how to do so.

Id. at 53648.

> Common sense may be used to support a legal conclusion of obviousness so long as it is explained with sufficient reasoning.

Id.

B. Proposed Rejections

Pursuant to 37 C.F.R. § 1.510(b)(2), Requester identifies claims 1-30 as the claims for which reexamination is requested. The proposed rejections below, in conjunction with the analysis in Sections IV-V above and the attached declaration of Dr. Abowd (Ex. PA-DEC), provide a detailed explanation of the pertinence and manner of applying the prior art to each of claims 1-30.

1. Proposed Rejection #1

Claims 1, 4-9, 11-12, 17-21, 24-28, and 30 are obvious over *Liebermann* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* above in Section V.A and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

2. Proposed Rejection #2

Claims 6 and 26 are obvious over *Liebermann* in view of *Harakawa* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* and *Harakawa* above in Section V.B and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

3. Proposed Rejection #3

Claims 7, 16, 17, 27, and 29 are obvious over *Liebermann* in view of *Mack* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* and *Mack* above in Section V.C and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

4. Proposed Rejection #4

Claim 10 is obvious over *Liebermann* in view of *Bushnag* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* and *Bushnag* above in Section V.D and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

5. Proposed Rejection #5

Claim 13 is obvious over *Liebermann* in view of *Meins* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* and *Meins* above in Section V.E and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

6. Proposed Rejection #6

Claims 2, 3, 14, 15, 22, and 23 are obvious over *Liebermann* in view of *Auten* under 35 U.S.C. § 103(a), as shown by the discussion of *Liebermann* and *Auten* above in Section V.F and the declaration of Dr. Abowd provided in Exhibit PA-DEC.

VII. Conclusion

For the reasons set forth above, the Requester has established at least one substantial new question of patentability with respect to claims 1-30 of the ’079 patent. The analysis provided in this Request and in the declaration of Dr. Abowd (Ex. PA-DEC) demonstrates the invalidity of claims 1-30 in view of prior art that was not substantively considered by the Patent Office. Therefore, it is requested that this request for reexamination be granted and claims 1-30 be cancelled.

As identified in the attached Certificate of Service and in accordance with 37 C.F.R. §§ 1.33(c) and 1.510(b)(5), a copy of this Request has been served, in its entirety, to the address of the attorney of record.

Respectfully submitted,

PAUL HASTINGS LLP

Dated: November 11, 2021

By: /Joseph E. Palys/
Joseph E. Palys
Reg. No. 46,508